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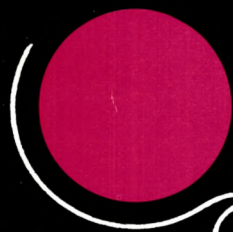
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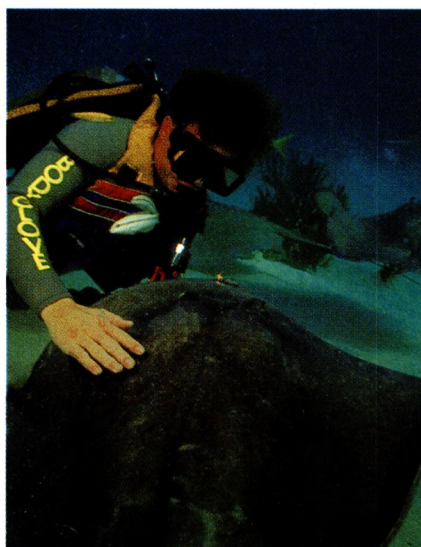




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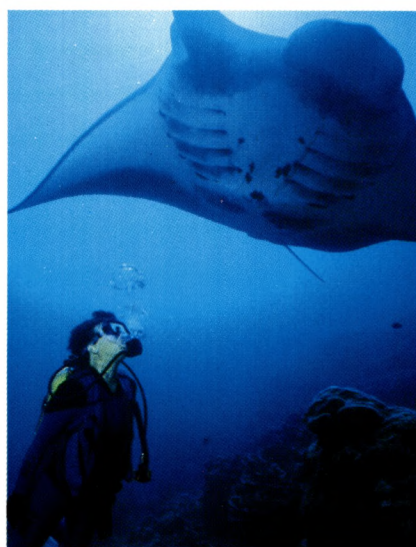
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Inside Scuba Diving

BY STEVE BLOUNT

THE \$10,000 QUESTION

Divers aren't all that demanding. Give us a good reef and a cold *cerveza* and we're happy. "What have you done for me *lately*?" isn't something that normally trips off tongues that have touched a regulator recently.

But once in a while, it's good to take stock of what people are doing for us. That's why we created the Robert Rodale Environmental Award, and why we've chosen Reef Relief of Key West, Fla., as the first recipient.

The award is named for Robert Rodale, longtime guiding light of Rodale Press and a visionary who believed that all life on Earth is connected and that we should treat our planet as we would have others treat us. Though he died tragically in an automobile accident in Moscow in 1990, his ideas are still improving the environment through the work of the company and its research groups.

Robert Rodale's constant theme was the power of people to improve their own lives; his motto, "You can do it."

Perhaps better than any marine conservation organization today, Reef Relief embodies this spirit of personal activism. Instead of complaining about damage being done to the waters of the Florida Keys, Craig and DeeVon Quirolo founded Reef Relief in 1986 to do something about the problems they saw jeopardizing the health of the area's reefs.

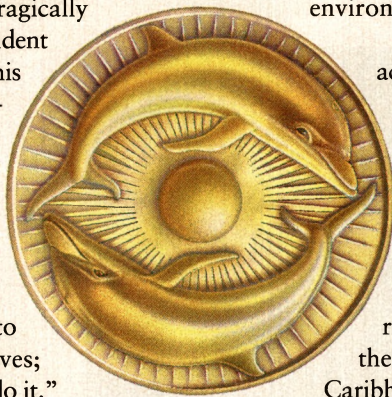
A partial list of their initiatives includes the installation of mooring buoys to help prevent coral damage; developing materials that educate the millions of tourists who visit the Keys

annually about the fragility and needs of the area's reefs; working to secure a permanent moratorium on oil and gas development in the Keys; voicing the concerns of divers for effective regulation of water quality; setting up photographic monitoring of coral reefs in the Keys; and supporting the work of marine biologist Harold Hudson in saving large individual coral heads from black band disease.

Reef Relief has also spread the word internationally, working with governments and private organizations throughout the Caribbean Basin on issues ranging from placing mooring buoys to creating marine parks to helping design tourist developments that don't harm their local environments.

These are not small accomplishments. With a small budget and a core of dedicated volunteers, Reef Relief has helped change the Florida Keys for the better, fulfilling its goal of bringing real relief to the reefs there and throughout the Caribbean.

We hope that our recognition of Reef Relief will encourage you to help the environment, too, by donating time or money to assist your favorite marine charity. But we believe that good words without good works are empty—so along with our sincere gratitude, we're giving Reef Relief a check for \$10,000 to expand its conservation programs. Craig, DeeVon and the volunteers, you have always had our sincere admiration. Now you have our cash as well. We know you'll use it well.



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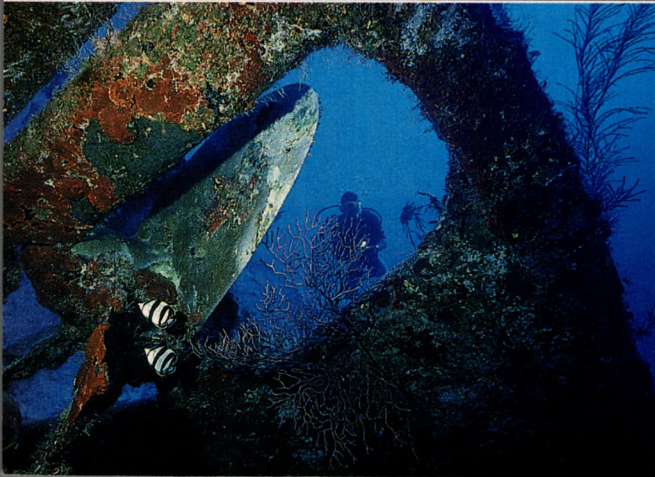
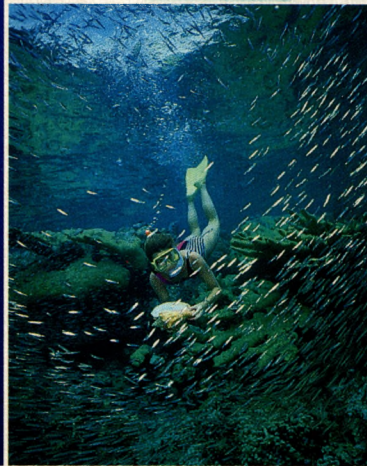
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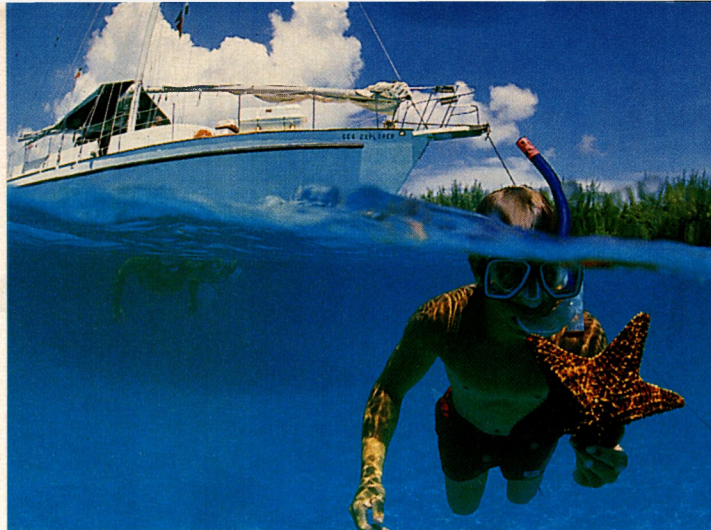
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TRAVEL

OUTER LIMITS

They may be close to Florida, but they're really over the edge. Adventure and the Bahamas Out Islands go hand in hand.

By Bill Belleville

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SIX-PAGE PULL-OUT MAP

Chart your own adventure in the Bahamas Out Islands.

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A new camera could change the way you shoot underwater video.

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A mid-water collision with a boat could ruin your whole dive trip; also aluminum versus steel tanks.

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PORTFOLIO: MANHATTAN TRANSFER

New York photographer Alex Kirkbride's painterly Polaroid transfers capture the essence of the underwater experience.

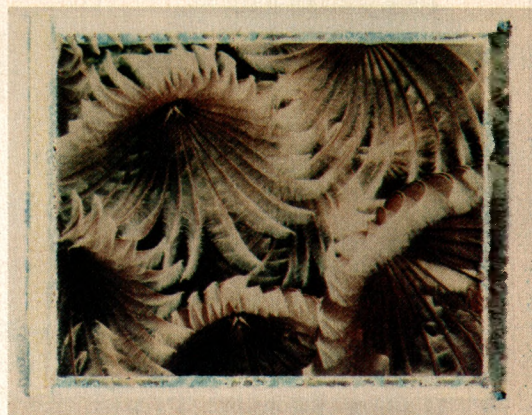
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Cover photography
by F. Stuart
Westmorland.
Models Dave and
Jennifer Fleetham, at
dusk on the Kona
Coast, Hawaii.



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Lizard Island

LIZ 0003

LETTERS

Net Effect

I thought you might pass along to your readers the message that there is a campaign to ban gill nets in Florida. Karl Wickstrom and the fine staff at *Florida Sportsman* magazine have been leading this campaign for about two years.

Logic having failed to convince the Florida Marine Fisheries Commission, Karl Wickstrom and *Florida Sportsman* as well as The Florida Conservation Association have now started a petition drive to get an amendment on the ballot to ban the nets. Let's hope the people of Florida get a chance to save their sea life.

ELTON LAMBERT
ANDALUSIA, ALA.

Thanks for the tip, Elton. Florida Sportsman and the Save Our Sealife Committee have already drummed up some 350,000 signatures. They'll need another 150,000 names to place the proposed constitutional amendment on the ballot in 1994.

If you're a registered Florida voter and would like to support the effort to ban gill nets in Florida's inshore and nearshore waters, call Save Our Sealife at 1-800-272-6387 for petitions and information.

You don't have to live in Florida to lend financial support to the cause. Send donations to: Save Our Sealife Committee, PO Box 4991, Orlando, FL 32802.—ed.

Save The Cephalopods

I was delighted and disturbed by the recent photos that won the RSD Photo Contest.

Delighted because two friends of mine both had winning pictures. Disturbed by the first place Marine Life picture. The octopus that was the star of that picture was very likely pulled from a safe location to model for Mr.

Jensen. This is analogous to the classic "stressed pufferfish" that, blessedly, is becoming more rare these days. I am told that the whitetip reef sharks that patrol those reefs are very capable of detecting where an octopus has been (by smell) and following him back to his hiding place.

Of course, I don't *know* how Mr. Jensen got his octopus. If he was fortunate enough to find his eight-legged friend flying out in the open, then good for him and I owe him an apology. If not, then I wish he would stop taking octopus pictures that way and I wish RSD would stop encouraging the practice by giving awards for such pictures.

LEE F. JONES
SAN JOSE, CALIF.

We do support safe imaging. See "Too Close For Comfort?" by Cathy Church (page 79). —ed.

Thin Air

You stated that it is illegal for dive boats in New York state to carry oxygen on board (May 1993). I'm a New York City resident and do most of my diving in the waters around the city.

The boats that travel out to the wrecks are probably among the best-equipped boats there are. Every boat that I've been on carries a large supply of oxygen. The oxygen is not hidden on these boats, and they do not hold back on its use. I have seen it used on a number of occasions. I have not been on a boat with less than a six-hour supply of oxygen, and most have 10 or 12. If it is illegal for the boats to carry oxygen in New York I am glad that no captain follows this rule.

AARON ISESON
FLUSHING, N.Y.

We were victims of a rumor that has apparently been making the rounds in

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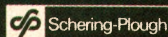
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the New York dive community—namely, that you must have a physician's prescription to buy oxygen in the state. Not true, says Steve Bielenda, captain of the Wahoo and president of the Eastern Dive Boat Association. While you must be specially trained and possess a certificate to administer oxygen, Bielenda says he doesn't know of a dive boat in the state that doesn't have oxygen on hand for dive emergencies. —ed.

Go West, Young Man

Hey, West Coast divers are getting left high and dry. Sure, you give us the token one article a month, but we want more.

NICK BOYD
QUINCY, CALIF.

OK, how about three times more? Check out our articles on California charter boats (page 60), the Scripps Aquarium opening (page 12) and Port Angeles, Wash. (page 67).

Deja View

It had been a hell of a week. My company is aggressively pursuing that malady of the 90s, "downsizing," and we were being asked to come up with a plan to reduce costs by 30 percent while still maintaining a high level of service.

Friday afternoon, the May 1993 edition of *Scuba Diving* arrived at my door. I was flipping through the pages, hoping for something to take my mind away from my troubles, and there it was. On page 127, a small photograph of the Cayman Aggressor dive deck, tanks and BCs in their racks, skins flying in the breeze. Cameras and lights filled the table amidships where Alex Kirkbride, one of the several passengers, kept his professional photography equipment. This was his photograph. There was my lycra dive suit drying in the breeze above the starboard rail. Our names were on the white board recording our dives for the day at Pedro's Walls, or maybe Big Tunnels.

For a moment I was transported to the deck, the gentle rocking of the boat and soft breeze so relaxing and welcome. Many thanks to you, and to Alex for reminding me how beautiful a planet we live on.

WILLIAM J. KELLY
GROVER BEACH, CALIF.



Sea Watercolors

Remember when you were a kid? Remember how your imagination let you take a brush and box of watercolors and blend the paints together to record your very own watercolor world? Remember the first time you went diving or snorkeling in a tropical ocean? From the moment you first peered below the ocean's surface you found yourself totally immersed in a world of watercolors.

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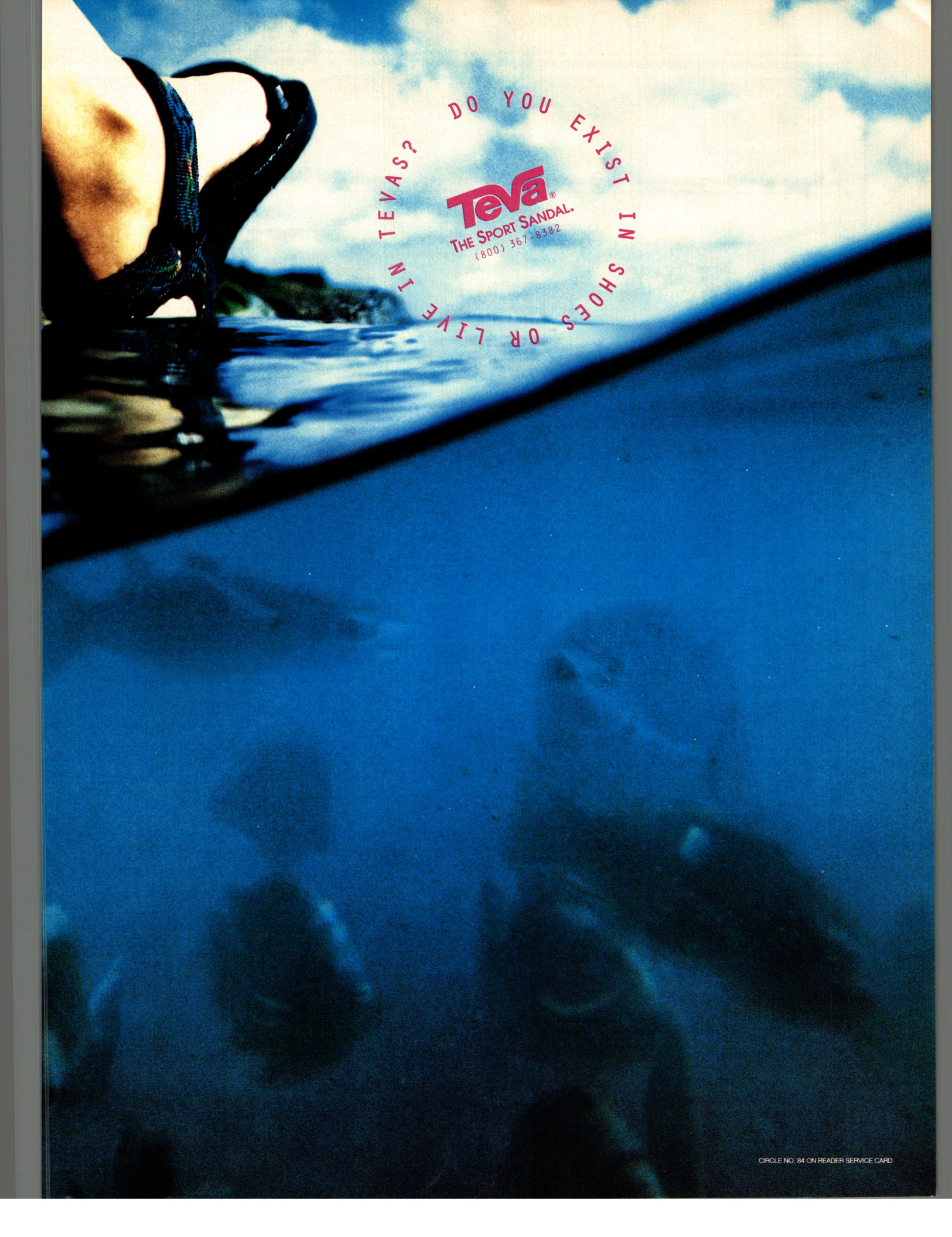
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THE VIEW FROM INSIDE A SHOE.

The view from inside a Teva.

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A close-up of a person's foot wearing a black Teva sandal, standing on a wooden dock. The dock is over a body of water, and the background shows a cloudy sky and distant land. The Teva logo and slogan are superimposed on the image.

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Scripps Aquarium Comes Home

It took more than 20 years, but when the trustees of the Stephen and Mary Birch Foundation made an unsolicited grant of \$6 million, the long-delayed plans for a new aquarium at Scripps Institution of Oceanography were on their way to realization. Opened in September, the new facility is more than four times the size of the former one, and has already taken its place as one of San Diego's most popular tourist attractions.

A central lobby divides the building into two areas, the aquarium and the museum. The aquarium exhibits focus on the West

habitat for black sea bass, leopard sharks, moray eels, halibut and other local species.

About a third of the tanks are devoted to tropical waters. Some display animals from the Sea of Cortez, the location of many Scripps research projects over the years. Another area is devoted to animals collected on expeditions to the Indo-Pacific region. These tanks contain jellyfish, lionfish, nautiluses and flashlight fish along with more ordinary warm-water creatures.

Outside, on a balcony overlooking Scripps Pier and the La Jolla shoreline, is an artificial tide pool. Its wave machine maintains a healthy population ranging from kelp and starfish to lobsters and garibaldi.

The permanent exhibit gallery of the museum is themed "Exploring the Blue Planet." A half-million dollar grant from the National Science Foundation has helped make this the first major exhibition in the United States to focus on all aspects of oceanography. The exhibits begin with recreations of the laboratory on the research ship *Challenger*, and that of the Scripps Institu-

tion in 1903.

Visitors encounter seven self-contained interactive exhibit areas, each dealing with a different aspect of how the oceans affect the Earth. These include a simulated submersible ride and exhibits on water movement, seafloor shift and ocean products used in everyday life. An adjoining gallery will house changing exhibitions.

"The major message of this facility is that we must use our marine resources wisely," says director Don Wilkie. "We want to take issues like the greenhouse effect, population, foods and drugs from the sea, and tell people, 'this is what we know.' We want to send people home with the message to take care of the resources of the planet."

Getting across a big message like that is never cheap. But, built at a cost of \$14 million, the aquarium turned out to be an incredible bargain. The land was already owned by the University of Califor-

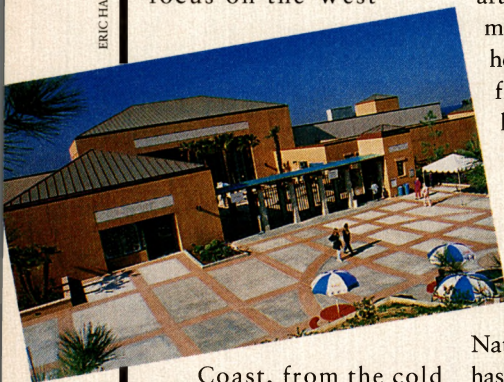


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nia, San Diego, the parent institution of Scripps. The difference between the Birch grant and the final cost was made up through private contributions and admission fees. Still, Wilkie points out, "Without the Birch contribution there would be no aquarium. You really need a major kick-off gift for a project like this, so people take it seriously."

The Stephen Birch Aquarium-Museum is located at 2300 Expedition Way (off North Torrey Pines Road), La Jolla, Calif., and is open from 9 a.m. to 5 p.m. every day except Christmas. For information call (619) 534-FISH. — ERIC HANAUER

Coast, from the cold Pacific Northwest through temperate California and on down to tropical Baja. The centerpiece is a 70,000-gallon kelp tank, where 20-foot plants sway gently in artificially induced surge, forming a



ERIC HANAUER



An Aquarium Grows in Brooklyn

RICK SAMMON

Sea Cliffs, a 300-foot-long re-creation of the rocky Pacific coastline, opened to large crowds on Earth Day this year at the Brooklyn Aquarium (now known officially as New York's Aquarium for Wildlife Conservation) near Coney Island. Sixty thousand square feet of naturalistic habitat, the new home of walrus, harbor and grey seals, sea otters and black-footed penguins over-

looks the Atlantic Ocean.

"Sea Cliffs is a state-of-the-art immersion exhibit of marine life," explains Aquarium Director Louis Garibaldi (an aptonym if we ever heard one). "Our hope is that by showing these magnificent creatures as they would be seen in nature—by giving people a chance to see life from the marine mammals' point of view—we can inspire New Yorkers and visitors to care about the fate of these animals and their habitat."

The inner corridors of Sea Cliffs display

underwater panoramas of animals in their natural habitats as well as smaller live, educational and interactive exhibits. Featuring views of life above and below water, both indoors and out, visitors are surrounded by a living animal environment.

The Aquarium is sponsoring special events all summer long. For more information contact Beth Weinstein at (718) 265-3426.

JUST CALL US WHALE GROUPIES

As sympathy for the great whales of the world continues to build and outrage at hunting of these mammals grows, Japan remains a major harvester—as well as consumer—of the giant cetaceans.

But, instead of offering an apology for their appetite, the Japanese have taken the offensive—and, boy, is it offensive—in an advertising campaign aimed at ending the global ban on whaling.

Critics, say Japanese government spokesmen, are merely "whale groupies" and "ecofascists." In fact, whale meat is not only tasty and nutritious, they say, it's chock full of natural remedies that cure everything from asthma to skin rashes.

Anyway, they say, the French are just as bad: "How would the French feel if Japan mounted a campaign to 'Save the Snails?'" asks Masao Kunihiro, a retired ecologist active in the campaign.

Gee: Snails, whales. Other than the rhyme, we miss the point. But then, we suspect, so do the Japanese.

DAVID FLEETHAM



IF THE JAPANESE HAVE THEIR WAY, YOU CAN SOON CALL THIS HUMPBACK MOM AND CALF SUSHI.

Bay Island Buoys

Conservationists in the Bay Islands of Honduras have launched a fund-raising program to help pay for badly needed mooring buoys on popular dive sites. Local dive operators, as well as resorts and other businesses, have already agreed to donate gear, boats, lodging and food to help fund the buoy installation. Now, they need your help to generate

the effects of increasing tourism. Mooring buoys, which allow boaters to tie up to a float instead of pitching a heavy metal anchor onto live coral, help prevent coral damage. If you've ever dived in Roatan, Guanaja or Utila—or if you plan to—you have a stake in the health of the area's corals.

Reef Relief founder Craig Quirolo, who with his wife DeeVon did a site survey last fall, determined each island will require 30 buoys. Some \$30,000 is needed, Quirolo says, and it is hoped the project can get under way this summer. The cooperative effort will involve Reef Relief, the Bay Islands Conservation Association (BICA) and the U.S. Peace Corps.

In addition to fund-raising events on the three islands, BICA is selling specially designed T-shirts to commemorate the project. It's also seeking donations from visiting dive clubs to sponsor single buoys at the rate of \$500 each. For more

information, contact Reef Relief at (305) 294-3100 or, while in the Bay Islands, BICA, Edificio Cooper, Calle Principal, Coxen Hole, Roatan, Islas de Bahia, Honduras.

the hard cash necessary to pay for the buoys, lines and mooring anchors.

Highly regarded among divers for their superb corals and plunging walls, the Bay Islands must now deal with



JULIA GORTON

THE HELLSHIP LOLLIPOP

A 147-foot freighter with a hold full of **SNICKERS**, **M&Ms** and **Three Musketeers** grounded in the Florida Keys National Marine Sanctuary in March, threatening to turn a popular **REEF** into an underwater version of Willie Wonka's Chocolate Factory—sans Oompah Loompahs.

It took salvagers more than a week to dislodge the *Miss BEHOLDEN* from Western Sambo Reef, but they managed to do so without spilling a drop of chocolate. The news for the reef, however, is not all that **SWEET**. A lawsuit filed against the owners of the ship seeks fines for coral damage, which it calls "catastrophic."

JUST WHEN
YOU
THOUGHT
IT WAS
SAFE TO
GO BACK
IN THE
WATER...



ERIC MARTIN

CRAIG QUIROLO



*3,000 giant clams have been
relocated on the Great Barrier Reef.*

Isn't Life A (Dirty) Beach?

Just when you think it's safe to go in the water, shit happens—literally. Winter and spring found Southern California divers stranded on the beach, jet fins at the ready, faced with signs from the health department warning them away from the water.

The culprit, as so often in the past, was sewage. The Hyperion Treatment Plant, Los Angeles County's main sewage processing plant, dumped over five million gallons of partially treated sewage into battered Santa Monica Bay, closing a 20-mile section of coastline to ocean fanatics.

A similar event occurred in Orange County, where the heavy rains caused a mudslide that damaged a county sewage line, spewing close to three million gal-

lons of sewage into the ocean which closed all beaches in the vicinity.

And finally, just to keep the beachgoers of neighboring Ventura County humble, a section of Ventura's Solimar Beach was also recently closed, this time not by a sewage spill but by an oil spill. Over 1,200 gallons of crude oil leaked from oil fields north of the county, drifted down in the current and beached itself in nasty tar globs stretching for a quarter mile.

The two sewage spills released more than 650,000 cubic feet of excreta, nearly enough to fill the interior of the Empire State Building and more than enough to make even King Kong turn up his nose. Any way you look at it, that's a *lot* of shit, so California beachgoers, watch your step.



A *TRIDACNA GIGAS* IN ITS NEW AUSTRALIAN HOME.

Now That's a Lot of Clams

Our kudos to the Australian Navy, who recently stepped in to help the giant clam, an endangered species that's been heavily fished by poachers on the Great Barrier Reef. Over a three-day period, a heavy landing craft was used to transfer 3,000 clams weighing a total of more than 20 tons from experimental beds off Orpheus Island, where they'd been artificially bred by marine biologists, to another location on the Great Barrier Reef. The operation was believed to be one of the largest relocations of marine organisms in quantity and weight.

Eighteen divers from the *Tarakan* and the Great Barrier Reef Marine Park Authority retrieved clams at high tide and lifted the mollusks, some measuring two feet across and weighing 40 pounds, into outboard-powered dinghies. When each dinghy was loaded with 10 to 20 clams it returned to the ship and the clams were gently unloaded by hand, placed in two-foot plastic tanks filled with sea water and then covered with shade cloth to minimize stress.

To protect the clams and allow them to reproduce undisturbed, the exact location of the clams' new home was not disclosed. The relocated clams will assist research on population outbreaks of the crown-of-thorns starfish, known for its destructive grazing of reefs.



RYAN NELLIS

NINA BICKNYT PICTURES

Thirty-something Relics Hit Bottom in Santa Barbara



LARRY STOLTZ

At the bottom of picturesque Santa Barbara harbor lies a small collection of wrecked boats from the early years of television. Whether sunk by coincidence or angry gods no one knows—but here they are. The trend started last year when choppy seas and an inattentive owner conspired to flood and sink *Argonaut*, the boat skippered by Lloyd Bridges in the epic “Sea Hunt” series (1957-61).

Built in Japan in 1950, *Argonaut* was most likely brought to America by a military officer returning from assignment in Korea. The unique teak-decked cruiser featured upper and lower pilots, long fishing outriggers, squarish chines, a fantail and a unique T-cross transom cleat. Onscreen or off, she was unmistakable.

Bridges’s TV exploits as frogman Mike Nelson no doubt inspired a whole generation of divers. But as far as we know, no one has yet tried to locate and dive the wreck of his faithful cruiser, which went down at anchor in about 30 feet of water. A Santa Barbara Harbor Patrol spokesman thinks there’s lit-

tle use in trying. Currents, wave action and shifting sand may have already broken the craft apart.

More recent events suggest that Santa Barbara may be something of a magnet for celebrity mahogany. One of the few remaining World War II Patrol Torpedo boats in the U.S., *PT 694*, was wrecked here in March. While this vessel never went to the South Pacific (most that did stayed there), fame found her anyway—first as the tender for Howard Hughes’s flying boat, the *Spruce Goose*, and then as *PT 73* on the TV series “McHale’s Navy.”

Recently acquired by the American Patrol Boat Museum for use by Sea Scouts, the 73-foot warship was originally powered by three supercharged Packard V12s boasting some 4,050 horsepower. She could do 40 knots (while emptying her

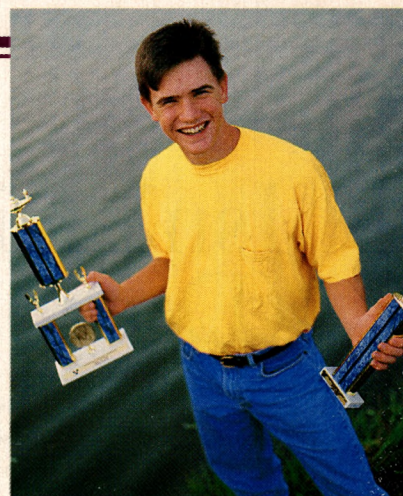
gas tanks at the rate of 475 gallons an hour). PT boats were so fast and capable that Navy sailors reportedly gave them two-to-one odds anytime they encountered Japanese Zeros.

All of this mattered little on the morning of March 25 when a mean Southeaster packing 50-mph winds broke *PT 694*’s anchor line and swept her into the surf. Pounded by six- to eight-foot waves, she soon broke apart. Washed ashore were her bow section, part of a makeshift cabin and most of the diesel power train. The whereabouts of her midsection, stern and a cache of tools and equipment are still unknown. What is known is that *PT 694* will be sorely missed by Sea Scouts, historians and the American Patrol Boat Museum. For more information, contact the APBM, P.O. Box 641, Rio Vista, CA 94571.



ABOVE, THE ARGONAUT AS IT LOOKED IN THE 1970S; AT RIGHT, SOME OF PT 694 TODAY.

BRUCE ARMSTRONG



DAN GAYE

GEAR UP AND FINISH YOUR HOMEWORK

A Florida 10th grader with diving skills and a nascent love for the sea has collected data showing which type of materials make the best artificial reefs.

With support from the Florida Sea Grant program, Matthew Adkins of Seffner, near Tampa, picked four types of building materials most likely to find their way under water as reefs: wood, aluminum, cement and PVC pipe. He anchored test batches of the materials in 20 feet of water in the Gulf of Mexico and made periodic dives to monitor them.

At the end of 10 weeks, Matthew brought the samples up and scraped the marine organisms from them for weighing. Cement, as Matthew had predicted, was the most conducive to the growth. But he also noted that seasonal changes, cold fronts and tides were hard on the marine growth.

Matthew next turned his attention to tracking the effect underwater habitats had on a cement artificial reef. The high schooler secured several cement blocks to buoys at sites in Tampa Bay and in the Gulf of Mexico. His finding? There was more marine growth on the blocks submerged in the nutrient-rich waters of lower Tampa Bay.

For his efforts, Matthew won awards at both the state and international levels and even discussed his work with a national team of scientists engaged in similar research.

Will divers go into the future as partners with the government?

Beware Greeks Bearing Gifts

Archaeologists diving in the Aegean Sea off the southern coast of the Greek island of Alonisos recently discovered a Greek merchant ship with a cargo of fine wine in clay jars (amphoras). From the mound of debris on the sandy sea floor, the archaeologists determined that this is the largest ship ever found from the fourth century B.C.

The ship appeared to be larger, in fact, than anything scholars thought had been sailing the Mediterranean at the time. While the

few previous wrecks studied were of ships measuring no more than 50 feet stem to stern, the Alonisos ship may have been as much as 85 feet long and 35 feet wide. The ship is considered to be in ideal condition because it appears to have settled to the bottom without capsizing or breaking apart; much of the wooden hull may be buried in the sand. The unburied remains—almost a thousand amphoras—were photographed in place. Four amphoras were brought to the surface for detailed analysis, which enabled experts to date the wreck between 400 and 380 B.C.

The entire site was mapped and an exploratory trench was dug, uncovering a rich cache of black-glazed ceramic wine cups and bowls as well as a bronze bucket and ladle.



NIP ROGERS

READER POLL

Will You Pay For Healthy Reefs?

Though common to many forms of outdoor recreation, user fees for divers haven't met with overwhelming approval from dive resorts, operators and some destinations. The need for and uses of such fees varies (see "World View," page 21), but the reality of declining resources at the federal level in the United States and the general lack of resources in many destinations means that if divers don't belly up to the bar and offer to help preserve coral reefs and other critical marine habitats, they may very well disappear during our lifetimes.

The issue of fees is far from remote: Bonaire and Saba already have such fees and the U.S. Congress has asked for a survey to determine whether fees should be imposed in the existing U.S. marine sanctuaries.

The concept of having those most directly concerned with a resource fund its preservation is well established in American tradition. If you hunt, the money you pay for a hunting or fishing license is used to pay wildlife officers, fund research on game populations and perhaps run fish hatcheries. In our national parks, admission fees and extra fees for backcountry hikers help defray the cost of maintaining the parks. On a more prosaic level, the money you pay for your automobile license tag and the taxes on gasoline help fund road construction.

Onerous though they may seem, user fees are probably part of our future. The question is, will we go into the future as partners with government, or will we be dragged kicking and screaming? If we go as partners, we have every right to demand that the monies collected from divers—all of them—be used to directly improve diving conditions, either through coral preservation or the conservation of other marine life.

To steal a phrase from ABC News, "It's your money; it's your choice."

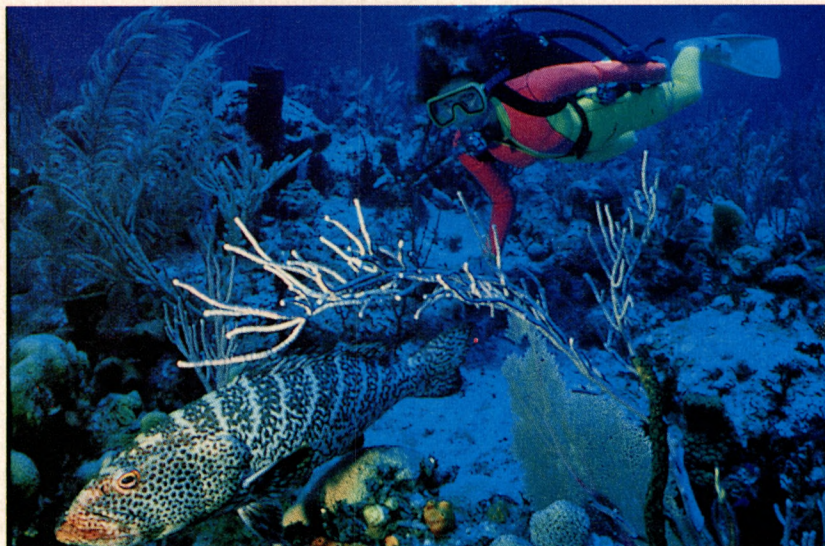
We'll report your vote in a future issue of *Rodale's Scuba Diving* and will pass the totals on to the National Park Service and to the National Oceanic and Atmospheric Administration.

Would you pay a nominal user fee to help fund marine protection efforts in outstanding diving areas?

DIAL: 1-800-DIVE-LINE (1-800-348-3546)
And follow the recorded instructions to vote.

Totals will be reported in a future issue of *Scuba Diving*.

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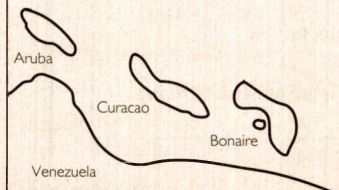
Divi Flamingo Beach Resort & Casino offers air-conditioned guest rooms and studios, two freshwater pools, a lighted tennis court and excellent seaside dining. Peter Hughes Dive Bonaire has a versatile fleet of dive boats, underwater photo and video instruction and 24 hour film processing. For information, rates and reservations: Divi Hotels Inc., 2401 N.W. 34 Ave., Miami, FL 33142. Tel: 800-367-3484 / Fax: 305-633-1621.

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THE WATER PLANET

DAS BOOT

Busloads of gawking tourists are coming to a reef near you.

BY DAVID ABRAHAMSON

Like all spheres of human activity, the underwater world has its own iconography. Specific symbolic meanings have over the years become inextricably linked to certain marine objects, both animate and inanimate. *Shark*, for example, may be a universal icon for *danger*. *Hard-hat diving helmet* suggests *work*, the strenuous, sweat-of-the-brow, heavy-lifting kind. *Seahorse* equals *delicate fragility*.

In most cases, the symbolism is quite stable, rarely changing over time. There are, however, exceptions. Though *porpoise* still evokes the notion of *playfulness*, scientific research in the last few decades has added a new meaning: *intelligence*. *Speargun*, on the other hand, may once have meant *manly adventure*, but now, for many, it suggests little more than *wanton brutishness*.

One of the largest iconographic shifts in recent memory involves *submarine*. For at least 40 years following World War II, that wellspring of popular consciousness, Hollywood, has imbued *submarine* with a variety of decidedly martial meanings: a special breed of run-silent, run-deep *valor*, as well as perhaps *peril*, *hazardous duty* and a certain self-sacrificing sort of *vulnerability*, *concealment* and *isolation*.

Since the mid-1980s, however, it can be argued that those warlike associations have had competition. The challenge has arisen from the success of a new kind of recreational vehicle. Ready or not, welcome to the new world of the "leisure submarine."

The origins of the recent interest in recreational submarining are fairly easy to chart. The current bloom in the

tourist submarine business began in 1985 with the launch of a 28-passenger vehicle in Grand Cayman. According to Bruce Jones, the chairman of the Marine Technology Society's Manned Submersibles Committee, there are now closer to 40 craft in operation around the world. Ranging in size from small two-person vehicles to much larger craft capable of carrying almost 50 people, tourist subs are currently operating at a number of locations in the Caribbean, as well as in the Canary Islands, Bermuda, Spain, France, Monaco, Egypt, Israel, Hawaii, Korea, Japan and Taiwan.

Jones estimates that more than three million customers, paying an average \$70 a trip, have been served to date.

In addition, a new class of craft, the semi-submersible, has evolved to meet the tourist demand. In concept, it can trace its lineage back to that old standby, the glass-bottom boat. Though both its exterior appearance and interior passenger compartments are fashioned to resemble those of a true submarine, the semi-sub does not submerge. Instead, customers sit in the lower portion of a heavily ballasted hull and observe the surrounding undersea vistas through large viewports.

Powered by marine diesel engines, semi-subs are in fact conventional surface vessels. But because they don't actually submerge, they are far less complex and far less expensive to operate than true submarines. Almost 20 semi-subs are currently in operation on Australia's Great Barrier Reef, and a U.S. company, Sub Sea Systems, has already launched five of its popular 34-passenger models.

For those with both the resources and inclination for



WAYNE VINCENT

slightly more private pleasures, there are also a number of "personal submarines" on the market. Small battery-powered "wet" (ambient-pressure) subs fitted with on-board scuba tanks cost between \$5,000 and \$30,000; most are designed to carry either two or three passengers to a maximum depth of 130 feet. One builder, Commercial Submarine Manufacturing, claims to have sold more than 750 craft.

A major step up in sophistication

from wet subs are the "one-atmosphere" or "dry" subs. With complex ballast, propulsion and life-support systems contained within a pressurized hull, they are true submarines. Both three- and six-person craft are currently available, and they can be operated at depths of more than 300 feet. The top-of-the-line model, the six-passenger *Deepmaster*, is equipped with both a marine diesel for surface cruising and battery power for diving. Its range is

more than 400 miles, and it can recharge its batteries while under way on the surface.

Given their commercial success in recent years, it's clear that leisure submarines are a significant new element in the larger world of underwater recreation. It can be argued that their success represents a widespread and growing curiosity about the underwater world. They can perhaps even be regarded as evidence of a heightened interest and concern for the marine environment. And it's no doubt true that, as one of the promotional brochures boasts, tourist subs do indeed provide the "highest possible level of comfort, visibility and safety" to their passengers.

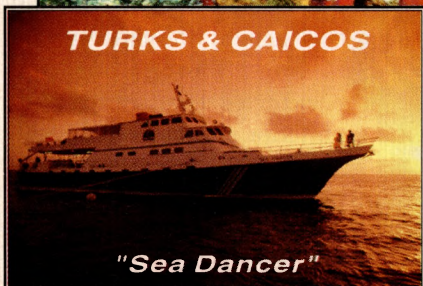
But there is also a vaguely troubling dimension to their success. If, for the sake of argument, one sets aside the important benefit of access for disabled, the old and the infirm, the thought of the able-bodied choosing to experience the wonders of the sea through a window is somehow disconcerting. Many of the true joys of diving are tactile as well as visual—the taste and temperature of the sea, the shape and texture of an empty shell. I've always believed that what's really special about diving is that it offers a unique sense of active, intimate and immediate involvement in the wondrous underwater realm. Which, of course, is something altogether different from the passive "comfort" found in a tourist submarine.

I have no quarrel with technology per se. Scuba diving equipment is itself an example of technological sophistication. But it's a specific technology that provides a specific benefit. If I had to sum up that benefit in a single phrase, the extraordinary opportunity, even if only briefly, to be *at one with the sea* would probably suffice. And that, I would argue, is simply not something that can be experienced through a pane of glass. ☉

Contributing editor David Abrahamson writes on natural history and environmental subjects for a number of national magazines, including the New York Times Magazine, Oceans and Science.

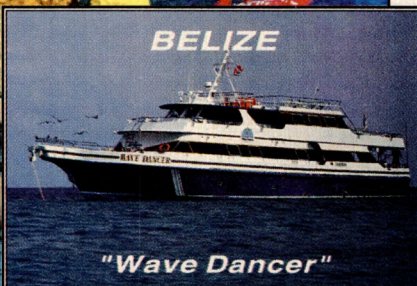
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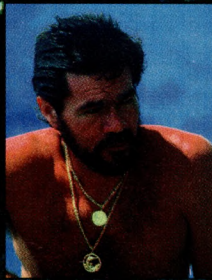


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DIVING FOR DOLLARS

BY JOHN L. STEIN

To harness dive tourism while protecting their valuable reefs, three Caribbean beauties—Bonaire, Belize and Saba—have recently implemented reef “user fees.” Rather than an attempt to milk extra profit from captive divers, these user fees are to be used to help sustain reefs on a long-term basis. This is always a concern in the development of dive destinations. For the same reason that Newark, N. J., is not a top tourist destination, smart business planners—and governments—know that good environmental stewardship is vital to the long-term economic viability of any destination.

The two most widely recognized and successful reef fee programs belong to Bonaire and Saba. Far from following the normal route of government-collected and administered funds, the diver fees collected on these islands don’t flow into government coffers at all. By law they can’t. Instead, the money directly supports marine park programs: reef monitoring and surveying, mooring installation and maintenance, ranger patrols, and publicity and education programs that ensure visiting divers know something about reef ecology. No purer or more direct relationship between contributor and cause can exist.

When diver fees were first proposed for Bonaire during the mid-1980s as a way to fund long-term reef protection, some commercial interests were skeptical that such a system could be good for diving. Reef access fees, they argued, would destroy diving instead of preserving it by discouraging divers and financially pinching dive operators.

But the special interests

were wrong. In Bonaire, which implemented the first reef-fee program in the Caribbean, the \$10-per-diver annual permit brought in \$185,000 in 1992, enough to run the island’s marine park program. Divers overwhelmingly supported the fee, and many donated additional money or purchased guidebooks and souvenirs, which also generated funds. If anything, said Kalli De Meyer, manager of the Bonaire Marine Park, “People are telling us that the fee is not high enough.”

Reef user fees are more than just good environmental stewardship. They’re also smart business.

Given the overall cost of a dive trip, who wouldn’t spend another 10 bucks to support dedicated moorings, provide education, information and anti-poaching patrols? Perhaps the fee’s detractors simply object to paying to use the ocean, to being told where to moor and whether or not they can spear fish.

In an ideal world, of course, there would be plenty of virgin reefs for everybody. But in our most candid moments we must admit that the world is no longer so free and easy, that our actions are farther-reaching than we previously thought and that the impact diving can have on fragile ecosystems does need to be addressed. In some cases buoy systems, education, monitoring and patrols may be the best tools of prevention.

A parallel to the Caribbean reef user’s fee already exists within our own National Park System. While fees are still a fairly new concept in the Caribbean, the NPS has collected them for decades. True, anybody who has sweated their way into the Grand Canyon at



LEE LEE BRAZEL/ART REF INC.

peak season can tell you that the required permits and regulations—not to mention crowds—can be annoying. Yet the popularity of such natural treasures demands they be protected. Some Caribbean dive sites may now have that same need.

Saba's recently implemented fee system applies to divers and visiting yachts. At \$2 per dive (collected by dive operators), one cannot by any means call the surcharge steep, and the money

goes a long way to providing the education and protection that Saba feels its reefs need. Last year, 100 percent of the Saba Marine Park's \$72,500 operating budget was provided by reef fees, souvenir sales and donations. This means that the island's 4,022 diving visitors paid an average of \$18 apiece. That seems a reasonable price to ensure that this Caribbean beauty stays that way.

Tom Van't Hof is a marine resources consultant, formerly with the

Dutch government, who helped to set up the Bonaire and Saba marine parks. According to Van't Hof, today 75 percent of the marine parks in the Caribbean are not managed and have no personnel. These "paper parks" thus have no real control over their own destiny.

"There is more to marine parks than buoys," says Van't Hof. Without monitoring programs, he explains, island governments are not even in the position to know what—or where—damage may be occurring. With increasing pressure on dive sites, such knowledge can be critical in learning what effects diving (or fishing, or harbor and resort development) may have on reefs.

Nowhere is the pressure on reefs more evident than in the Florida Keys, which hosts some half a million divers every year. Mooring buoys and protective legislation have been in effect here for well over a decade, and in the Keys National Marine Sanctuary alone there are now more than 330 buoys, each of which cost some \$250 annually to maintain. Thankfully, adequate funding for this work has so far been provided by federal and private sources. To date, says Billy Causey, sanctuary superintendent, "we have not called for any fees for divers, nor are we looking at any visitor use fees or strategies." However, Causey added that Congress has asked for a user fee survey for all marine sanctuaries nationwide.

The future is unclear. The day of the free reef—like the free lunch—may be over. Divers are accustomed to paying departure taxes to fund airports and bed taxes to fund airports and water systems. Reef fees may be the best way to ensure the survival of the coral we came to see. 

Further information on the National Marine Sanctuary Program may be obtained from the National Oceanic and Atmospheric Administration (NOAA), Office of Ocean and Coastal Resource Management, Washington, D.C. 20235.

John L. Stein is an avid diver, surfer and author based in Santa Barbara, Calif.

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Gilliam is a 22-year veteran of the diving industry. Specializing in advanced training programs, he is president of Ocean Tech and a member of NAUI's board of directors. He has authored seven books and is a contributing editor for Rodale's *Scuba Diving*, *Sub Aqua Journal* and *AquaCorps*.

Three weeklong trips are scheduled for 1993. From Aug. 21 to Aug. 28, Gilliam will be aboard the *Coral Star* in the Bahamas, departing from Great Exuma and cruising to Conception Island and San Salvador. Package prices range from \$1,345 to \$1,645 per person. Then he will move down to the Bay Islands of Honduras aboard the *Isla Mia* for two trips, Sept. 15 to Sept. 22 and Sept. 25 to Oct. 2. Bay Island trips cost \$1,045 per person.

For more information on Gilliam advanced diver trips contact CARIBBEAN ADVENTURES at 1-800-934-3483.

INDONESIAN DIVE CRUISES

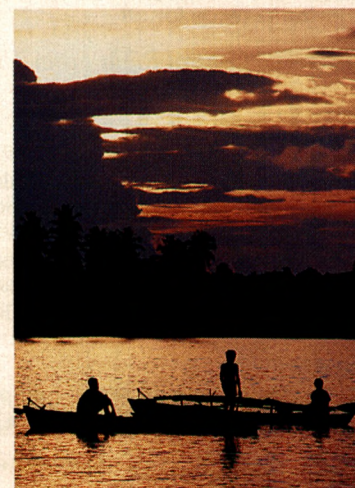
Landfall Productions is offering dive trips to the islands of eastern Indonesia aboard the 148-foot *Cebili*, operated by Undersea Discovery.

It's been estimated that more species of fish and coral inhabit the reefs of Indonesia than anywhere else on Earth. Until now most of these areas have been accessible by only a few hardy travelers.

Cebili offers five seasonal itineraries through the year visiting the Sangihe and Talaud islands, the Togian islands, the Spice islands of the Molucca Sea,



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or Bay Islands by
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BRET GILLIAM
(ABOVE LEFT)
WILL HOST THREE
WEEKLONG LIVE-
ABOARD TRIPS.
EXPECT SPEC-
TACULAR SUNRIS-
ES WHEN YOU
CRUISE INCREDI-
BLE INDONESIA
(LEFT).

the west Bonda islands and Lucipara, and the east Banda, Gorong and Ceram islands. Packages are nine nights and 10 days with a seven-night cruise offering up to five dives daily including night dives. The cost of the trip is \$1,960 for a single share or \$2,261 for a double.

Passengers are put up in 10 air-conditioned staterooms. *Cebili* is outfitted with two compressors and two water makers, so full tanks and fresh water are always in abundant supply. The on-board rental department offers dive gear as well as underwater cameras and videos to complement the E-6 film processing and video editing facility.

For more information contact LANDFALL PRODUCTIONS at 1-800-525-3833 in the U.S. or (510) 794-1599 in California.

SHIPWRECK DISCOVERED OFF GRENADA

A Foundation for Field Research team has located the wreck of the *Orinoco*, a steam- and sail-powered vessel that sank in 1901 in the waters off Grenada. According to legend, the island custom of lighting candles on the graves of dead

relatives on All Souls Night caused the wreck of the *Orinoco* when her helmsman mistakenly identified the hundreds of flickering lights of St. David's graveyard as the lights of St. George, the capital of Grenada. Turning toward the candlelights, the helmsman rammed St. David's Point at full speed.

The wreck, sitting in 12 to 30 feet of water, appears to be about 120 feet long. Its steel masts lay to the side, the large boiler sits at a tilt, and the ship is broken into pieces scattered about the reef. A large stingray and sea turtle make their home in the wreck. Underwater documentation of the wreck is now under way.

The Foundation for Field Research is a nonprofit organization that uses



volunteer divers willing to contribute a tax-deductible share-of-project cost and their labor. At present the foundation has three projects on Grenada that need divers: the ongoing underwater survey for shipwrecks around Grenada, the underwater excavation of a 1649 French colony and a marine biological project surveying the reefs around Grenada to determine their health.

The foundation mails out a free 36-page newspaper about these and other projects. You can contact them at (809) 440-8854 or fax them at (809) 440-2330.

A FAMILY AFFAIR

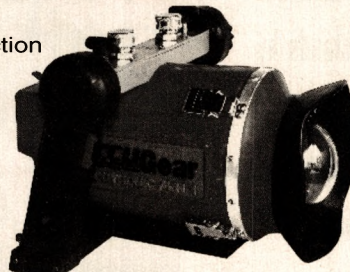
Planning a dive vacation but don't know what to do with the kids? Rascals in Paradise is offering four Special Fam-

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The Latest Breakthrough in Underwater Housings!

AVH-1 MADE IN U.S.A.

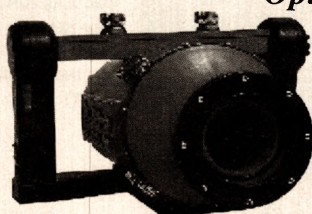
- ♦ Heavy duty PVC construction
 - ♦ Depth rating to 250 feet
 - ♦ Zooming control
 - ♦ Auto/Manual focus
 - ♦ Time lapse video
 - ♦ Main power on/off
 - ♦ Start/Stop recording
 - ♦ Replacable dome port
 - ♦ 4 x aspherical viewfinder
 - ♦ Built-in hydrophone
 - ♦ Neutrally bouyant
 - ♦ Audible indicator beep announcing system
- Beeps once for on & twice for off



Complete Electronic Control Right From The Handle!

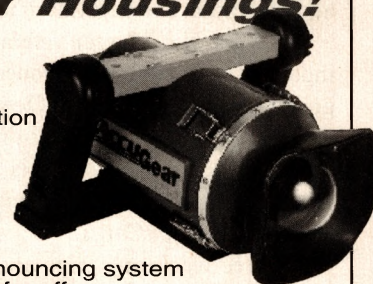
AFP-1 FLATPORT

- Options:**
- Accutronic Flatport AFP-1
 - Accutronic Color Monitor ACM-1
 - Accutronic Color Filter ACF-1
 - Surface Video Cable RVC-1
 - AHL-1 100W Halogen Light
 - AHL-2 200W Halogen Light
 - AVH HARD Carrying Case
 - AVH PADDED Carrying Case



AVH-2

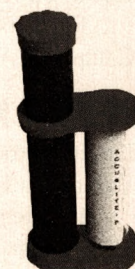
- ♦ Heavy duty PVC construction
 - ♦ Depth rating to 250 feet
 - ♦ Main power on/off
 - ♦ Start/Stop recording
 - ♦ Replacable dome port
 - ♦ 4 x aspherical viewfinder
 - ♦ Neutrally bouyant
 - ♦ Audible indicator beep announcing system
- Beeps once for on & twice for off



AVH-2Z NEW With Zoom Control Breath Taking Videos At Depths Up To 250'

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ily Weeks during the month of August at the Sand Dollar Condominiums and Beach Club on Bonaire.

Special Family Weeks include all sorts of extras for diving parents and their kids. Organized activities are offered for toddlers through teens. As members of the Sand Dollar's Sand Penny Club, they get to learn about the marine environment while they snorkel, and they receive coupons for free or discounted books and games. For babies, each Rascal family has its own personal babysitter to help out when needed. This way, parents can go diving knowing that their kids are having just as good a time as Mom and Dad are.

Sand Dollar condos (ranging from studios to one-, two- or three-bedroom units) have fully equipped kitchens, cable television and air-conditioned bedrooms, each with a breathtaking ocean view.

Since all families have their own unique requirements, family packages are individually priced. For individual package pricing and other information contact RASCALS IN PARADISE at 1-800-U-RASCAL or fax them at (415) 442-0289.

SPECIALTY SCHEDULE

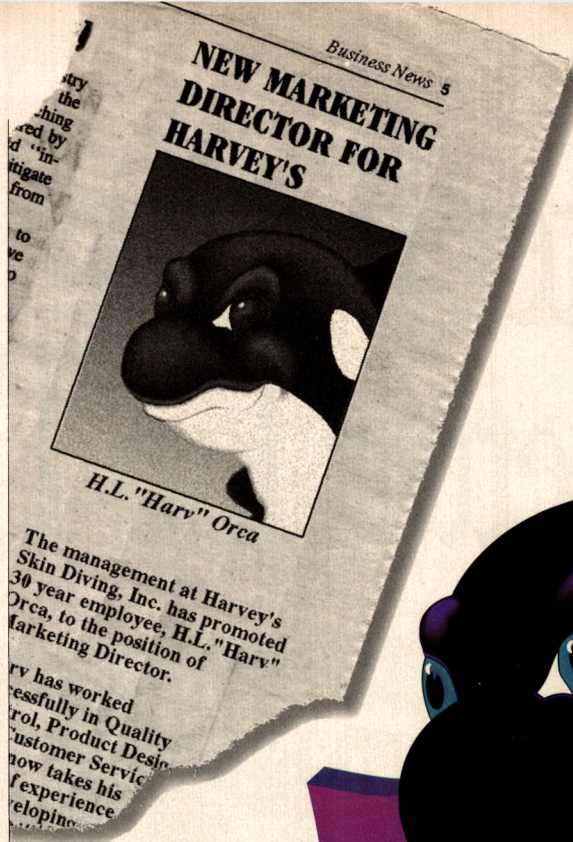
Undersea Expeditions, a tour operator serving gay and lesbian divers and snorkelers, has released details of its fall schedule.

First is a trip to the Red Sea and ancient Egypt Oct. 2 to Oct. 17. A favorable exchange rate and revised itinerary providing for a full week in Sharm el Sheikh have combined to reduce the price of the trip to \$1,000.

From Nov. 13 to Nov. 20 Undersea Expeditions will be leading a trip on board the dive boat *Wave Dancer* to Belize, touring the offshore islands of the largest reef system in the western hemisphere. Prices start at \$799 for a week's diving, accommodations and meals.

Cozumel is the destination Sept. 25 to Oct. 2 and Dec. 26 to Jan. 2. Accommodations, two daily boat dives, a night dive and breakfasts and dinners are included for \$779.

Brochures outlining upcoming adventures can be obtained by calling 1-800-669-0310 or (415) 398-2189 in northern California.



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Harv wants to start his new job off on the right fin by offering you a terrific gift to celebrate his big promotion. All you have to do is go to your nearest authorized Harvey's dealer and ask how to get your gift from Harv. While you're in there, check out Harvey's great new suit styles for spring and summer diving.

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The more time a diver spends on the bottom, the more he realizes that some of the world's most fantastic dive spots are in Bonaire and Cayman Brac. But truly experienced divers realize just how important top time is too. That's why a Divi Resort is the only place to stay if you want every second to count. Whether it's at the Tiara Beach Resort on Cayman Brac or the Flamingo Beach Resort and Casino on Bonaire, Divi has all the amenities you'd expect from a world class diving resort. Casual bars and restaurants. Tennis courts. And beautiful sun-drenched beaches.



But Divi Resorts have so much more than that. From our Peter Hughes Diving centers to our complete underwater

Peter Hughes Diving

photographic facilities, you'll see that we're here for one purpose, to provide the best dive experience in the Caribbean. Both under the water and on land.

Call now for special group rates at either resort, and get details on 2 for 1 diving in Bonaire or a 7th night free at Cayman Brac.

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GEAR BAG

New—and Unusual—Products

A new camera lets you capture great underwater video and enjoy your dive at the same time.

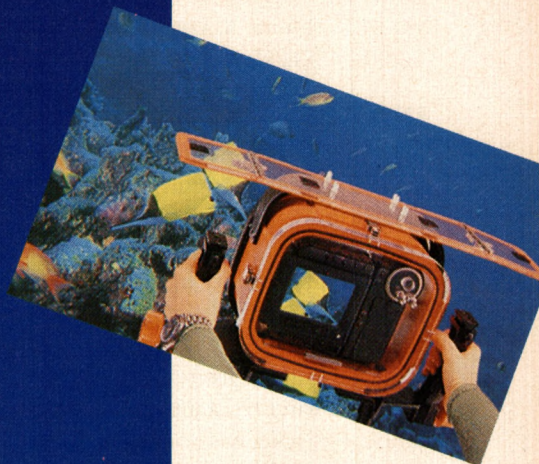
NEW POINT OF VIEW Underwater video is one of the best ways to remember your dive trips and to share the experience with your friends back home. But if you spend all your bottom time struggling to peer through a tiny viewfinder from behind a dive mask, you could miss half the fun.

Sharp Electronics has remedied this annoyance with its new Hi-8mm ViewCam and optional underwater housing. A full-color four-inch LCD screen built into the ViewCam lets you see what you're recording without having to squint through the lens. The underwater housing is depth rated to 164 feet, making it the perfect tool for diving videographers.

With the ViewCam, you can swim freely, holding the camera at arm's length and still see what you're recording. And when you get back on the boat, your fellow divers can gather around the monitor to see themselves on tape.

The suggested retail price for the ViewCam is \$1,999, and the underwater housing costs an additional \$1,899.

For more in-



Sharp Electronics' ViewCam (above) puts underwater video at your fingertips. The Rattler (left) is an attention-getter.

The Bimini Breaker (right) is the perfect après-dive cover. The Divers Safety Slate (below) features two mirrors for emergency signalling.



formation or ordering call SHARP ELECTRONICS' SPECIAL MARKETS DIVISION at 1-800-748-3113.

BREAKER BREAKER Designed for use in warm to medium-cool temperatures and in weather ranging from a light drizzle to eight-foot waves breaking over the bow, Pro Dive Clothing's new Bimini Breaker lightweight boat jacket works and wears just as well on shore.

Constructed from a highly water-repellent, wind-resistant and breathable fabric, the jacket has deep front pockets that zip, a roll-up full-hooded collar and is vented front and back with a breathable mesh liner to keep you cool but dry. A pair of buckles concealed inside both sleeve pockets snap together so the jacket can be attached almost anywhere on the boat for storage or to dry out.

The Bimini Breaker retails for \$95 and is available in five sizes. For more information contact PRO DIVE CLOTHING, 1-800-800-DIVE or fax (305) 767-8312.



DEAR DIARY Have you run out of room in your old dive log, or just lost interest in making entries? If so, check out SSI's two new dive logs: the blue Total DiveLog System and the black Platinum DiveLog System. Both are sturdy, durable binders with pages that are easy to fill out, pre-dive checklists and lots of other useful functions that make recording your dives fun as well as informative. DiveLogs can be used by all divers, regardless of certification.

The Total DiveLog System leads you through levels one to five (up to

100 dives). At each level you receive stickers indicating how many dives you've completed. This shows at a glance how much experience you have and provides a set of obtainable goals for new divers that will lead to higher levels of comfort and skill.

The Platinum DiveLog leads you through levels six to 10 (101 to 1,000 dives). As with the Total DiveLog, stickers showing your increasing levels of experience are available. The pages are bound in booklets of 100 dives, two dives to a page, on water-resistant paper. This system allows you to take just one convenient booklet on the dive boat so you can leave the rest of your valuable log in your bag, car or hotel.

The Total DiveLog System retails for \$52.95; the Platinum DiveLog System for \$69.95. For more information call SSI at 1-800-892-2702 or fax (303) 482-6157.

BUT DOES IT HAVE SPELL CHECK? Take some notes while you're being rescued with Innovative Scuba Concepts' Divers Safety Slate, a reflective signalling device coupled with an underwater writing system.

The acrylic slate has two reflective mirrors that can be used in an emergency to signal shore, a boat or a plane. The other side has a three-dive log section. The Divers Safety Slate comes with a plastic pencil, an all-brass key ring to eliminate corrosion and a plastic BC clip.

The slate is available in hot pink, green, orange and white, and retails for \$13.95.

For more information contact INNOVATIVE SCUBA CONCEPTS at (719) 597-2885 or fax (719) 597-4150.

SHAKE IT ALL AROUND New from dB Products is the Rattler, an underwater communications device. This rugged, compact device is less than seven inches long and weighs about six ounces.

Like a baby's rattle, if you shake it, the Rattler makes a tremendous racket;

don't shake it and it's quiet. It can be heard for more than 100 feet under water, yet requires no power or air. The Rattler is great for divemasters and dive instructors leading group dives or anyone who just wants to attract a dive buddy's attention.

Available in black, red, yellow, blue and pink to coordinate with dive gear, the Rattler retails for \$24.95.

For more information contact dB PRODUCTS at (305) 566-2367.

THE RIGHT STUFF For those who suffer from sore gums and jaw fatigue from an ill-fitting regulator mouthpiece, Rite Bite mouthpieces are available in three sizes for a more comfortable fit. Designed according to the natural position of the jaw and teeth, Rite Bite is more comfortable and secure, and nearly eliminates jaw fatigue.

Created by dentist and diver Don Kinkade, Rite Bites are made out of C-flex, a FDA-approved flexible plas-

tomer. Rite Bite retailers use a disposable measuring stick that allows them to find the proper mouthpiece size for each diver. Once your size is determined, you simply select the appropriate Rite Bite mouthpiece from the three sizes.

Available in clear, orange and black, the Rite Bite carries a suggested retail price of \$15.95.

For more information contact DON KINKADE at 1-800-669-2483 or fax (303) 352-1402.

MASK SAVER Losing a mask, especially one with a prescription lens, can completely ruin a dive trip. So Aquarius Manufacturing Company has introduced its Mask Float, sort of a life jacket for your mask. If your mask comes off while under water or if it's accidentally dropped overboard, Mask Float prevents it from going to the bottom.

Mask Float easily slips over any mask strap, it's comfortable to wear and helps keep hair from becoming entangled in the mask strap. Mask Float sells for \$8.95 and is available in eight colors.

For more information contact AQUARIUS MANUFACTURING COMPANY at 1-800-435-8974 or fax (603) 889-5320. 



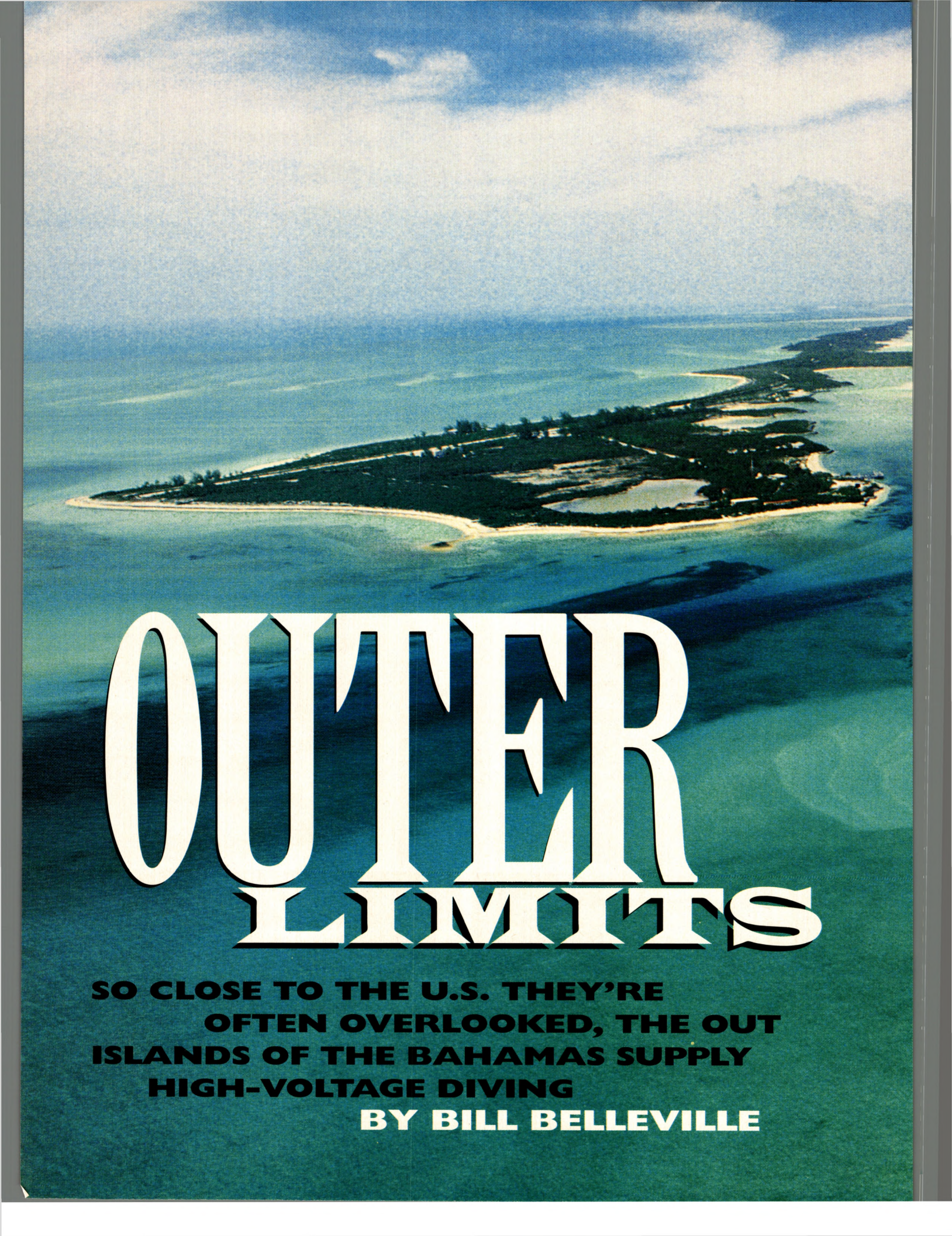
Same Diver.

Different Film.

Presenting the first film to capture truly accurate color underwater. New Ektachrome Underwater film. Created just for use underwater, this is the only film so extra-sensitive to red light, it offsets the underwater "blue haze." For sharp, rich, accurate color.* Why use ordinary chrome film when you can come out of the blue?

*If strobe or flash is used, a Tiffen UW filter is needed to prevent oversaturated reds.



An aerial photograph of a small, elongated island in the Bahamas. The island is covered in lush green vegetation and has a few small buildings. It is surrounded by shallow turquoise water with visible sandbars and reefs. The water transitions to a deeper blue as it extends towards the horizon under a bright blue sky with scattered white clouds.

OUTER LIMITS

**SO CLOSE TO THE U.S. THEY'RE
OFTEN OVERLOOKED, THE OUT
ISLANDS OF THE BAHAMAS SUPPLY
HIGH-VOLTAGE DIVING**

BY BILL BELLEVILLE



STEPHEN FRANK

FROM THE WINDOW OF A SMALL COMMUTER PLANE, THE limestone Out Islands of the Bahamas seem as ethereal as cloud vapor, on the verge of dissolving and then reforming inside their vast, dappled green banks. I have the feeling I could watch the island boundaries reshape themselves like lines on an Etch-A-Sketch—*rhinos, bunnies, the face of Elvis*—pristine white beaches and mangrove wetlands that merge into lush swatches of sea grape, sapodilla and silver palm giving way to forests of slender pines bristling like porcupine quills in the soft limestone.

STEPHEN FRANK



DIVING THE CIVIL WAR WRECK
IN TREASURE CAY; REACHING
FOR THE STARS IN BIMINI.

Diversity—of diving grounds, habitats and inhabitants—brought me here. I see it in the symmetrical blue holes, left over from the last Ice Age when the banks were dry and the aquifers—like the ones in Florida—became pockmarked with sinkholes. I find it in the whitecaps foaming on the reefs that snake along the windward shores, sheltering countless patches of coral and the occasional shipwreck. And I discover it where the coral-mottled bottom falls off the edge of the Earth—beyond the last wall, down a thousand fathoms and more, far past the migrating humpbacks and the whale sharks, down where the only color is an endless blue.

These places make me press up against the airplane porthole like a kid, eager as I was on the best Christmas morning of my life. Eager to get down there on it, to stick a regulator in my mouth and dive until I simply can't dive any more.

These are the Out Islands: the Abacos, Andros, the Exumas, Eleuthera, Cat Island, Long Island, the Berry Islands, Bimini. Geographically they're no farther from the U.S. mainland than Nassau or Freeport, but they're decades apart in topside development. Though lacking the flashy night life of Cable Beach and Lucaya, they reward divers with sites that equal the best in the Caribbean. Above water, the island styles range from the posh fish-and-dive club on Walker's Cay to

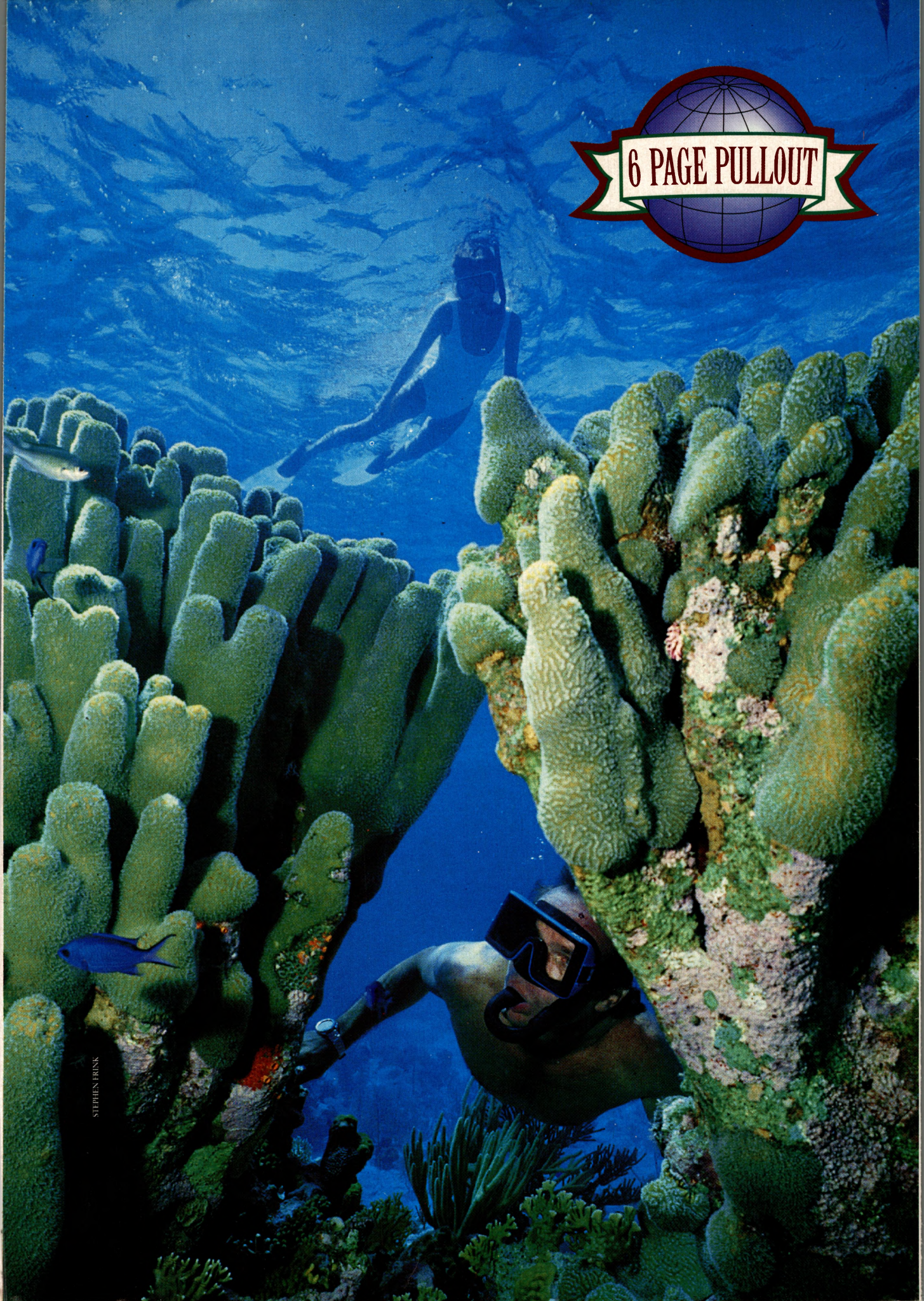
the away-from-absolutely-everything ambience of Cat Cay.

This split personality is easy to fathom. The British loyalists who settled in Nassau after the American Revolution were largely merchants and financiers; the ones who spread out among the other islands were farmers and fishermen. Today, four-fifths of the Bahamas' quarter-million residents live on New Providence or Grand Bahama Island, so the other 28 or so inhabited islands have plenty of elbow room for "belongsers" and visitors alike. "There's no waiting in line on the boat or at a dive site," says Bill Keefe, longtime dive operator in Bimini. "That's what the Out Islands are all about."

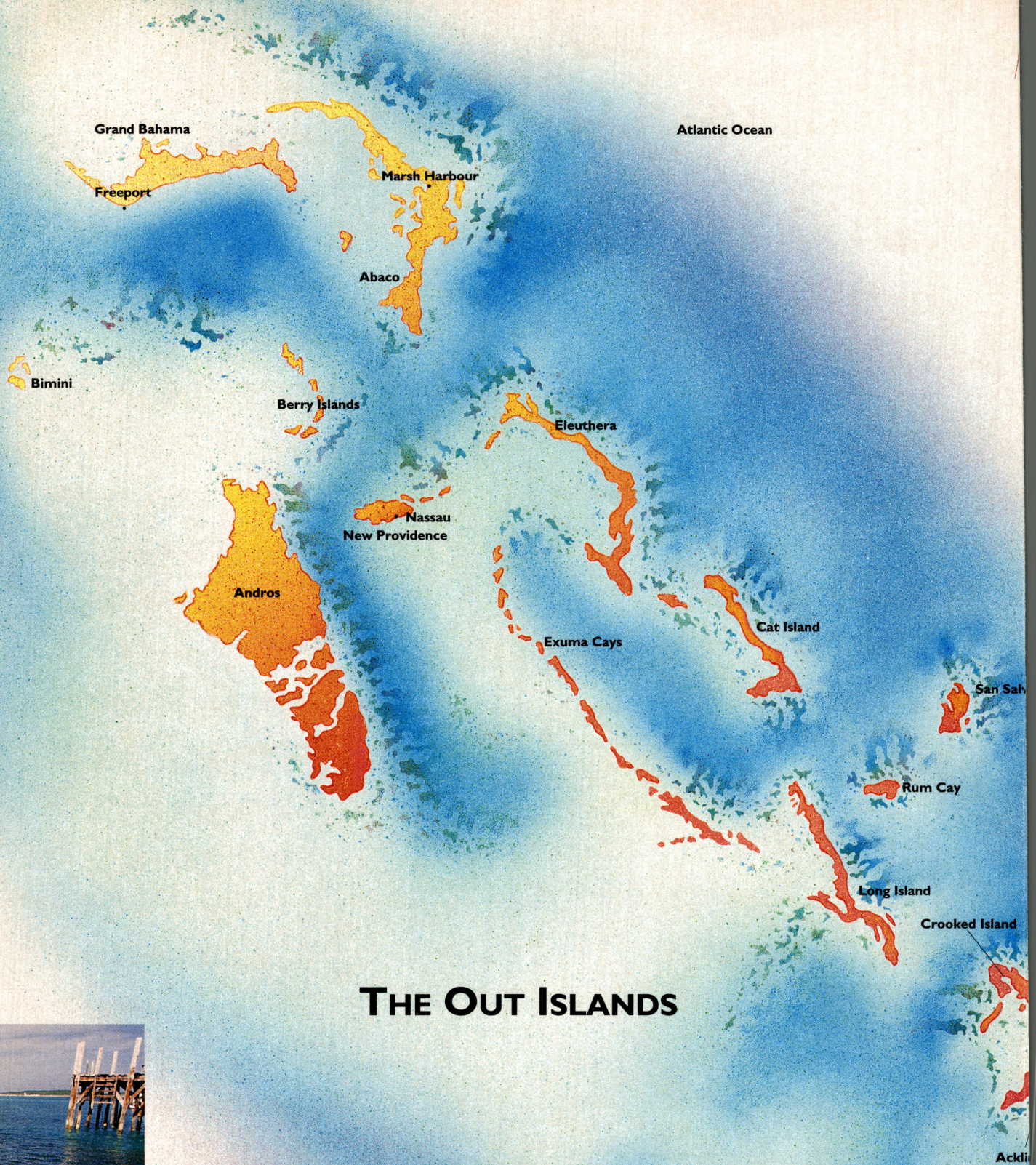
And while all share a natural legacy linked to the land and the sea, they differ vastly in personality.

Harbour Island, at the north tip of Eleuthera, is packed into a single square mile while Andros—where there may be more blue holes than people—sprawls across nearly 140 miles of the Great Bahama Bank. Some islands, like Spanish Wells and the cays sprinkled along the reef off Abaco—Man of War, Great Guana, Elbow—are populated mostly by Caucasians; others are home to black Bahamians.

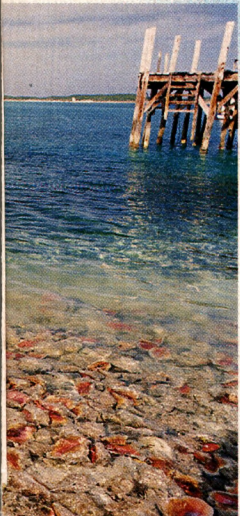
Columbus, the first European visitor here, probably landed on San Salvador. Returning home, he characterized the place as idyllic—"very green and fertile and the air very balmy." Some 500 years later, Brent Symonette,



STEPHEN FRISK



THE OUT ISLANDS



ROBERT HOLLAND

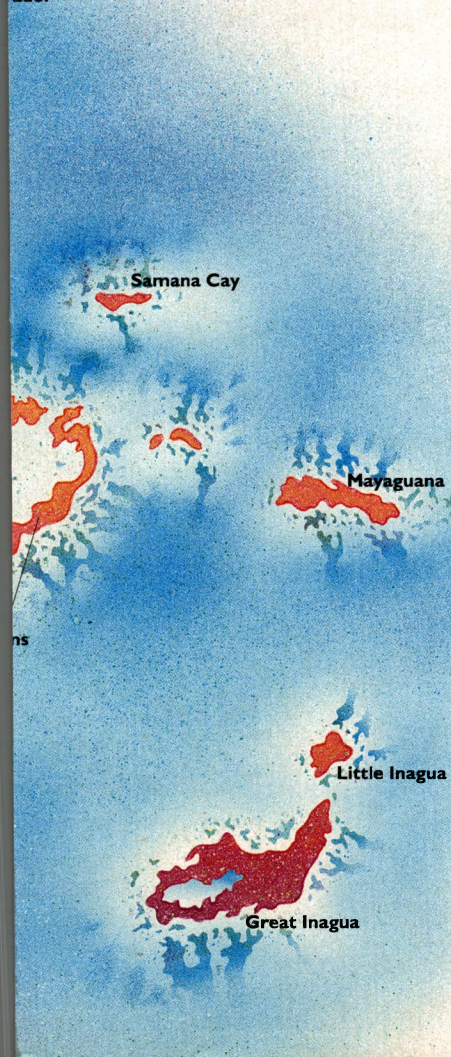


A BARRACUDA KNOWN AS THE GUARDIAN (ABOVE) IS LANDLOCKED IN ONE OF THE BAHAMAS MANY BLUE HOLES (RIGHT). THE BRONZE TINT OF THE BARRACUDA'S SCALES IS CAUSED BY HYDROGEN SULFIDE IN THE WATER.



BRIAN J. KAKUK

ador



1015, Chalk's International, 1-800-4-CHALKS or (305) 359-7980, American Eagle, 1-800-433-7300 or (305) 520-3056, Island Express, 1-800-767-0380 or (305) 359-0380, Gulfstream, 1-800-992-8532, Walkers International, 1-800-432-2092 or (305) 359-1400. Hotels or resorts which will pick you up in their own plane include Fernandez Bay Village (from Nassau), 1-800-940-1905 or (305) 792-1905, Small Hope Bay Lodge (from Fort Lauderdale), 1-800-223-6961 or (305) 359-8240, Stella Maris Resort (from Fort Lauderdale), 1-800-426-0466 or (305) 359-8236. Several private charters including Aerojet, Air Link, Miami Air charter and Congo Air also fly to all Family Island airports. Together, there are some 50 airstrips in the Out Islands alone, along with many full-service marinas. You can reach many of the smaller islands by water ferry or even mailboat.

Don't forget, there's a \$13 departure airport tax when you leave.



HOTELS:

From \$75 a night for clean but spartan rooms to \$150 or more in upscale resorts. The best deals are the dive packages, which usually come in several different levels, from dorm-like bargains to top of the line, and can be booked through dive operators or dive travel specialists.



DIVERSIONS/NIGHTLIFE

SPECIAL ATTRACTIONS: There are very few man-made diversions outside of Bimini and its colorful nightlife; however, on Andros, you can take a self-guided tour of the Androsian fabric works housed in an old warehouse of a defunct resort. And almost all the islands have stone remains of Loyalist plantations, but few are actually promoted as "tourist attractions" and most are hidden back in the tropical foliage. On Cat Island, the stunning Hermitage is a sized-down replica of a stone Italian monastery where its builder—the mysterious Father Jerome—was said to have studied. Situated at the top of the highest point in the Bahamas at 206 feet, the site affords a stunning view of both sides of the island, as well as a perspective into the spirit of a man who worked and lived here alone for the last years of his life.

GROUND TRANSPORTATION: Taxis, taxis and more taxis. All are government regulated at about \$1.50 a mile, so don't worry about getting ripped off. In cases of longer drives—especially to Marsh Harbour or Treasure Cay at the north end of Abaco—it's cheaper to fly Bahamasair at \$120 round-trip than to pay \$140 for a taxi, sans tip.

SHOPPING: Very little opportunity for the shop-till-you-drop crowd and bargains are hard to find since nearly everything is imported and costs more than it does back home. The best—and most authentic—souvenirs usually aren't widely advertised; they include the ornately engraved postage stamps with island scenes, the Bahamian dollar bill commemorating the Columbus Landfall, the quality straw-woven goods made by the "ladies" in the Exumas, Cat Island and elsewhere and "Androsia," the exquisite island-themed batik wear made on Andros—almost half-priced if you can buy them at the little store next to the factory near Fresh Creek.

OTHER SPORTS: Many resorts and hotels have tennis courts. The "sailing" islands of the Abacos, the Exumas and Eleuthera usually offer "barebone" sailboat rentals, from \$500 to \$1,500 a week depending on size and luxury. Windsurfing rentals are more commonplace and every island has its windward side; some, like Harbour Island and Eleuthera, get enough awesome surf breaks to justify international surfing competitions. Totally righteous, dudes.



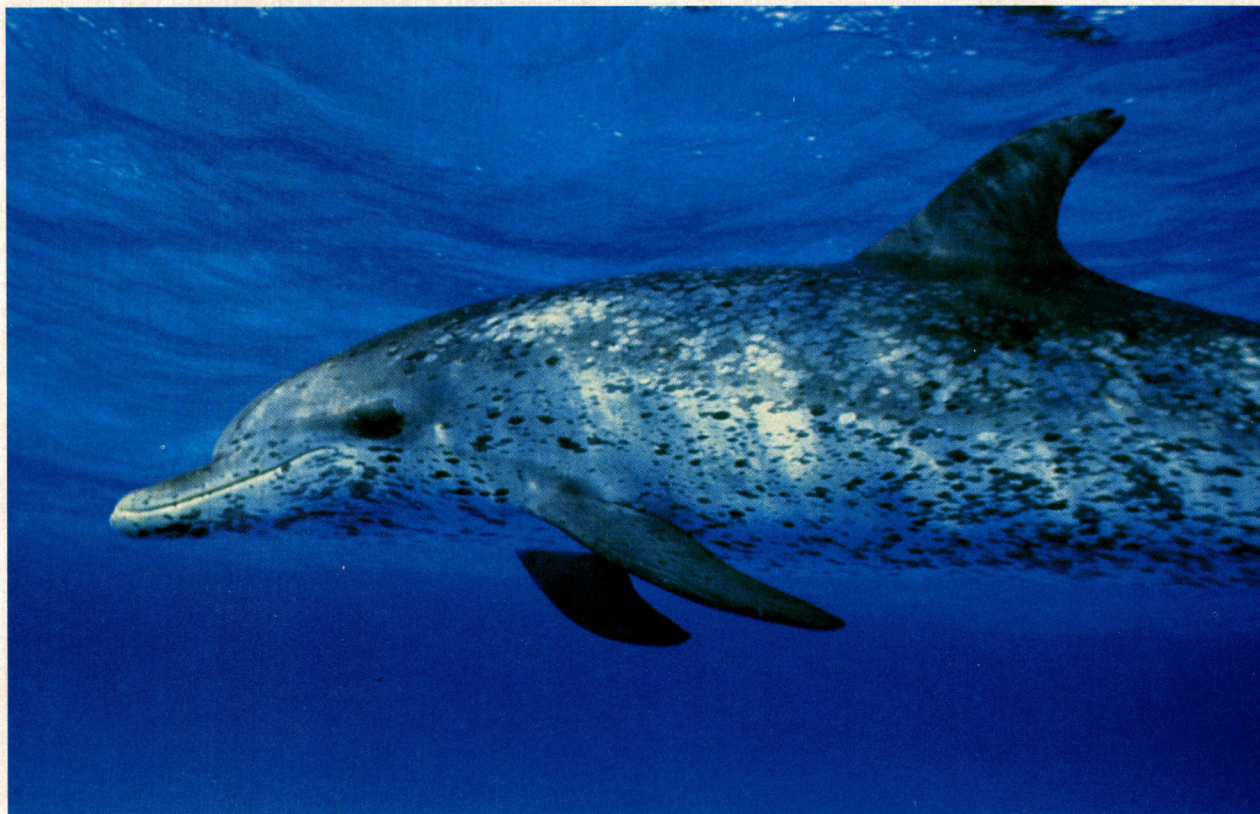
JUST IN CASE

There are health centers and clinics scattered throughout the islands, and major hospitals in Freeport and Nassau. The only recompression chamber in the Bahamas is in Freeport. In case of diving emergencies, call the Divers Alert Network emergency line at (919) 684-8111

FOR FURTHER INFORMATION

Bahama Out Islands Promotion Board, 1100 Lee Wagener Blvd., Suite 206, Ft. Lauderdale, FL 33315, Tel. 1-800-688-4752 or (305) 359-8099.

PARK IT: The Bahamas Trust Wants You



ALEX KIRKBRIDE

Beneath a 22-mile-long tract of tropical water between Compass Cay and Wax Cay in the Exumas lie some of the finest specimens of coral and marine life in the entire Bahamas. And, since this is a national park, it's likely to stay that way.

Welcome to the Exuma Cays Land and Sea Park, a 176-square-mile chunk of water and land that became the hemisphere's first undersea park in 1958, predating Florida's John Pennekamp Coral Reef State Park by two years.

Exuma Cays functions as a virtual aquarium of fish and shellfish since no surface fishing or trapping is allowed. (Spearfishing with scuba is outlawed everywhere in the Bahamas.) The result is a replenishment area that lets mature animals breed and spawn without the threat of being pulled from the water before they have a chance to complete that vital process.

The park owes its success to the charitable Bahamas National Trust, a working example of how a not-for-profit agency can establish and maintain national parks and reserves. It would be much like letting the Audubon Society run the U.S. park system. "We're supported by membership," says Trust Director Gary E. Larson in Nassau. "We rely on that and an endowment to run our parks."

Established when the Exuma park was founded in the late 1950s, the Trust also oversees other marine parks

in the Out Islands including Pelican Cays Land and Sea Park (a 2,100-acre preserve with undersea caves and a diversity of corals just north of Cherokee Sound on Great Abaco), Union Creek Reserve (an enclosed, seven-square-mile tidal creek on Great Inagua used by researchers working with endangered green turtles) and a portion of Conception Island (a sanctuary for nesting greens as well as a rookery for sea birds).

Other areas likely to be included in the system in the future include the extensive reefs of Fowl Cay off Marsh Harbour, shallow areas on Abaco that act as a marine nursery, the west shore of San Salvador; a marine nursery area for spiny lobster near Chub Cay and portions of the vast barrier reef off Andros.

Additionally, Larson says the Trust has launched a program to "teach teachers to use the land and waters of the islands" as a natural history classroom. They're also writing a National Ecotourism Strategy for the new government, which will likely include some type of user fee for park visitors. Such fees will help pay for the maintenance of mooring buoys, like the 35 buoys recently installed in the Exuma park by John Halas.

Members of the Trust get a newsletter, discounts on services and shopping in Nassau and the satisfaction of knowing they're making a difference. Memberships begin at \$15. For more information, contact Bahamas National Trust, P.O. N4105, Nassau, Bahamas. (Tel. 809-393-1317; Fax 809-393-4978.)



GENERAL

LOCATION: Archipelago stretching from just north of West Palm Beach for 750 miles to the southeast within 50 miles of Cuba, covering about 100,000 square miles of ocean. Technically, all of the Bahamas are in the Atlantic since they are above Cuba and Hispaniola, yet they are usually grouped regionally in the wider Caribbean Basin.

TOPOGRAPHY: Low-lying limestone islands formed when coral covered eroded ancient volcanic humps when the sea was higher. Blue holes—which are collapsed sinkholes—are found inland as well as in the ocean.

CURRENCY: The Bahamian dollar is at par with the U.S. dollar, which is accepted everywhere, along with most major credit cards.

LANGUAGE: English.

DOCUMENTS: U.S. citizens need only a copy of their birth certificate, legal photo ID, and round-trip ticket. However, it's always easier returning to the U.S. if you carry a passport. (Canadians and citizens of the UK need a passport). A visa is not required.

ELECTRICITY: 120 volts; 60 cycles.

CLIMATE: Summer heat mitigated by breezes; winters mild, although cold fronts can create chilly nights in January and February.

AIR TEMPERATURE: Winter: high 70s during day, 60s at night; Summer: high 80s to low 90s during the day, 70s at night.

TOURIST SEASON: Year-round, but the rates are highest from Christmas through Easter when snowbirds need a warm fix.

DIVING SEASON: Year-round, but late spring through fall usually offers the flattest seas and clearest diving conditions. That reality, coupled with off-season discounts from 10 to 30 percent, draw the most serious divers in the summer.



DIVING

WATER TEMPERATURES: From low 70s during February to high 80s in the summer.

THERMAL PROTECTION: A lightweight wetsuit will get you through the coldest months; a skin, especially one of the new insulated models, will take care of the marginal times.

VISIBILITY: Usually from 100 feet upwards; the proverbial 200 feet is not unreasonable in the summer, but expect consecutive cold fronts during the winter to sometimes cut visibility to 50 or 60 feet.

DIVING SKILLS: Although widely known for "easy" shallow diving, there are plenty of excellent sites off every island to provide challenges to intermediate and advanced divers. Dive versatility includes day and night dives on barrier and fringing reefs, blue holes with caves for qualified divers, wreck and drift dives. Full certification, as well as specialty courses, are available almost everywhere.

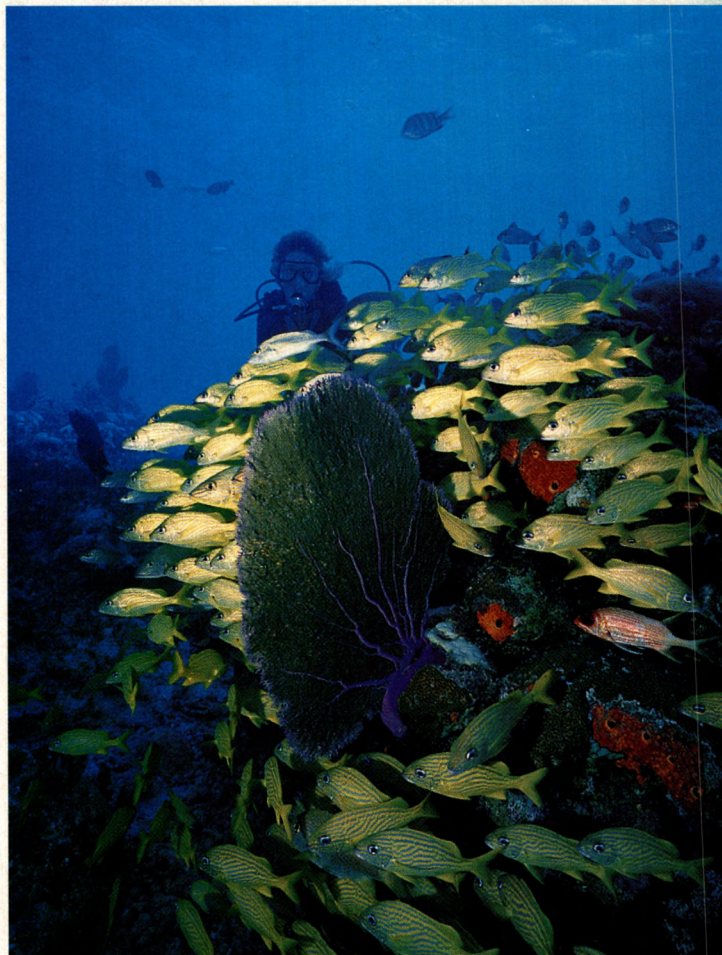


GETTING THERE

The Bahamas are one of the most accessible diving locales. In the continental U.S., American Airlines has round-trip flights from Miami (\$120-\$180) and New York City (\$400-\$650), with connecting flights from most major U.S., Canadian (Toronto and Montreal, \$460-\$1,190, and Vancouver, \$600-\$1,500), and European cities (London, \$1,140-\$2,550, Frankfurt, \$1,260-\$3,000, and Paris, \$2,500). For reservations, call 1-800-433-7300 in the U.S. Delta Airlines flies out of Atlanta (\$305-\$402), and Fort Lauderdale and Miami (\$110-\$140), with connecting flights from most major U.S. and Canadian cities. In Europe, Delta offers round-trip service from London (\$1,000), Paris (\$2,055), Rome (\$1,200) and Frankfurt (\$1,200). For reservations, call 1-800-221-1212 in the U.S. USAir has flights originating in Charlotte (\$305-\$345), Philadelphia (\$350-\$387) and Tampa (\$130-\$160), with connecting flights from most major U.S. and European cities. USAir also flies to Nassau from Montreal and Toronto (\$260-\$290). For reservations, call 1-800-622-1015. Air Canada flies to Nassau from Toronto and Montreal with connecting flights available from Vancouver. For booking information, call 1-800-776-3000 in the U.S.; check directory assistance in your province for 800 telephone numbers in Canada. Additionally, these airlines fly directly from Florida to some Out Island air strips: Bahamasair, 1-800-222-4262 or (305) 593-1910, USAir Express, 1-800-622-



M. TIMOTHY O'KEEFE



STEPHEN FRINK

A DIVER AND LARGE NASSAU GROUPER EYE EACH OTHER (TOP LEFT).

DWELLINGS IN HOPE TOWN ARE MODEST BUT COLORFUL (TOP RIGHT).

A FLOTILLA OF GRUNTS SURROUNDS A SEA FAN OFF BIMINI (ABOVE).

WHILE QUEEN CONCH ARE BECOMING RARE THROUGHOUT THE CARIBBEAN, ABACO'S FISHERMEN STILL KNOW WHERE TO FIND THEM (RIGHT).



SMOOTH OPERATORS: Choice Dive Deals In the Bahamas

	Primary Dive Areas	Specialties/Services	Boats/Divers	Morning Dive	Afternoon Dive	Snorkeling
Bimini Undersea Adventures (809) 347-3089 fax: (809) 347-3079	Bimini Island Chain North Bimini	night diving specialty courses checkout dives	42': 28 divers 36': 12 divers	2 dives/package price departs 8:30 am	2 dives/package price departs 1:30 pm	\$25
Brendal's Dive Shop International Ltd. (809) 365-4411 fax: (809) 365-4272	Abaco Coral Caverns San Jacinto	fish and eel feedings dive/picnic trips night diving	29': 16 divers	1 or 2 dives/\$35-\$65 departs 9 am	1 or 2 dives/\$35-\$65 departs 1:30 pm	\$25
Club Med (809) 331-2000 fax: (809) 331-2458	San Salvador	night diving underwater naturalist kayak diving	(2) 48': 40 divers	2 dives/package price departs 8 am	1 dive/\$25 departs 2 pm	yes
Dive Abaco (Abaco) (809) 367-2787 fax: (809) 367-2980	Grouper Alley Cathedral Maxi Cave Bay	night diving personal tours reef diving	30': 16 divers	2 dives/\$60 departs 9:30 am		\$30
Dive Odyssey (Abaco) (809) 367-3774 fax: (809) 367-2819	Fowl Cay National Park Sandy Cay National Park Chub Rocks	personalized services blue hole diving video/photo services	31': 12 divers	2 dives/\$55 departs 8:30-9:30 am	2 dives/\$55 departs 1 pm	\$30
Exuma Fantasy (809) 336-3483 fax: same	Great Exuma Little Exuma	eco dives blue hole diving small boat rentals	25': 12 divers 20': 6 divers	1 or 2 dives/\$40-\$65 departs 10 am	by arrangement	\$30
Guanahani Divers (San Salvador) (809) 331-2631 fax: (809) 365-4272	Fernandez Bay Southwest Point French Bay	night diving personal marine ID tours photo courses	47': 18 divers 42': 20 divers 30': 10 divers	2 dives/\$50 departs 9 am	1 dive/\$35 departs 2:30 pm	\$15
Island Marine Dive Shop (Abaco) (809) 366-0282 fax: (809) 366-0281	Fowl Cay National Park Sandy Cay National Park	personal tours small groups marine ID courses	23': 6 divers	1 dive/\$40 departs 10:30 am		\$25
Pittsstown Point Landings (Crooked Island) (809) 344-2507, 1-800-PLACE 2 B fax: (704) 871-8771	various walls and wrecks	personalized services small groups	18': 6 divers	\$35 per dive at divers' request	\$35 per dive at divers' request	yes
Romora Bay Club (Harbour Island) (809) 333-2325 fax: (809) 333-2324	Fish Bowl White Hole Current Cut	small groups photo instruction night diving	31': 14 divers	1 or 2 dives/\$28-\$56 departs 9:30 am	1 or 2 dives/\$28-\$56 departs 1:30 pm	\$15
Scuba Bimini* 1-800-848-4073 fax: (904) 223-4814	Bimini Trader Victory Reef Cat Cay Wall	Bimini fish count project introduction to the tropical reef course	42': 24 divers 38': 24 divers	2 dives/package price departs 9 am	2 dives/package price departs 2 pm	yes
Sea Club at Fernandez Bay Village (Cat) (809) 342-3043 fax: (809) 342-3051	East, West and South sides of Cat Island	marine ID courses photo courses personal tours	25': 8 divers 16': 4 divers	1 or 2 dives/\$35-\$70 at divers' request	1 or 2 dives/\$35-\$70 at divers' request	\$20
Small Hope Bay Lodge (Andros) (809) 368-2014 fax: (809) 368-2015	Andros Barrier Reef	custom tailored dive schedule free intro resort course one-on-one certification	36': 24 divers 28': 15 divers	2 dives/\$50 departs 9:30 am	1 dive/\$40 departs 2 pm	\$10
Stella Maris Resort Club (Long Island) (809) 336-2106, 1-800-426-0466 fax: (305) 359-8238	Shark Reef Conception Island Wall Barakuda Heads	shark feedings blue hole diving personalized services	65': 35 divers 32': 14 divers 27'-28': 8-9 divers	1 or 2 dives/\$35 & up departs 9 am	1 or 2 dives/\$35 & up departs 2 pm	yes
Valentine's Dive Center (Harbour Island) (809) 333-2309 fax: (502) 897-6486	Current Cut Harbour Island reefs and wrecks	personal charters resort courses children's resort courses	34': 25 divers 25': 10 divers	1 dive/\$30 departs 9:30 am	1 dive/\$30 departs 1:30 pm	\$20
Walkers Cay Hotel & Marina (Abaco) (809) 352-5252 fax: (809) 352-3301	Shark Canyon Spiral Caverns Pirates Cathedral	night diving video courses shark diving	(2) 35': 16-20 divers	2 dives/\$50 departs 9 am	1 dive/\$25 departs 2 pm	\$15

* You must book your dives before arriving in Bimini; no walk-in traffic allowed.

the recently appointed minister of tourism, observed that while Nassau and Freeport are "action-oriented resort areas," the Out Islands are still pristine and laid back. "Eco-sensitive," he called them. To keep them that way, the government is developing a strategy to promote smaller-scale development and activities—such as diving—that don't threaten the environment.

Bulked Up On Calcium Carbonate

And what an environment it is: Far more than just monotone shallows convenient to the U.S. mainland, these islands are blessed with coral caves, deep and shallow water habitats, blue holes, barrier and patch reefs and some of the healthiest gorgonians and reef-building corals I've ever seen.

The rich water that pours into the 6,000-foot-deep trench known as the Tongue of the Ocean between Andros

and the Exumas bears some responsibility for this natural wealth. Islands north and east of the Tongue—from the Abacos south to Mayaguana—benefit from being the first traces of sand and coral to be washed by the open Atlantic, long before it reaches Florida and the Caribbean Sea.

Marine biologist Ed Haxby says there's a geological reason for the profusion of corals here. When much of the Earth's water was frozen in glaciers during the last Ice Age, "the Bahamas were on a plateau as high as 300 feet above sea level."

As the glaciers retreated and water returned to the ocean, the sea rose, turning this plateau into the Banks, submerging all but the highest limestone "mountaintops" under 10 feet of water. The result was a marine environment so saturated with calcium that calcium carbonate actually precipitates from the seawater in spontaneous bursts of fine oolitic sand. "They're

called 'whitings,' " says Haxby, who set up a dive operation on Great Exuma two years ago. "For years, people thought they were bonefish tailings."

Over time, the oolites (clumps of calcium carbonate) harden providing valuable bottom substrate where the floating planktonic larvae of hard and soft corals can set up housekeeping. The saturated water acts like a Fort Knox of building blocks, providing a surplus of calcium as the polyps go about the business of secreting their individual castles, eventually forming a reef. And that's why divers find spectacular displays of elkhorn, staghorn and other reef-building corals here.

Hang A Left At Atlantis

At Bimini, the Gulf Stream surges northward close to the lee coasts of North and South Bimini. These islands, isolated

Dive Pkgs	Hotel Pkgs	Certifi- cation	Gear Rental	Gear Repairs	Gear Sales
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	
✓	✓	✓	✓	✓	
✓	✓		✓	✓	
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	
✓	✓		✓	✓	
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✓	✓	✓	✓	✓	
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✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓

from the others at the northwest tip of the Great Bahama Bank barely 40 miles from Miami, are a good place to begin an Out Island dive odyssey.

I boarded a Chalk's sea plane—a Turbo Mallard—in Nassau and watched in fascination as it taxied off the edge of the tarmac, settled down in the water, and then, after some consternation on my part, took flight. Half an hour later, we splashed down and rolled up onto a bank in the midst of the main street of Alice Town on North Bimini. As I deplaned, the Turbo Mallard dripped sea water on the asphalt like a big, wet dog.

Bimini, I soon learned, is an anomaly since its major reef line—bereft of the chance to prosper in the vast sand banks to the east—trails along the west side of the island. The narrow width and low profile of Bimini allows the strong morning sun to nurture the corals, which grow in linear patches.

The Gulf Stream comes within a

half mile of shore, pumping in all manner of planktonic critters while the massive banks out back supply the nursery ground. As a result, the same dynamics that make Bimini a center of big game fishing keep the fish population plentiful and diverse all the way up the food chain.

There's also a stunning 2,000-foot drop-off that begins around 140 feet; divers drift above in the Gulf Stream current, a sensation akin to bungee jumping without the trauma of the fall.

For those who like a more stationary experience, the Bimini Barge rests in 85 to 100 feet of water a mile west. Here, smaller pelagics like wahoo, tuna and permit swoop in on a three-quarter-knot current to mix with colorful reef fish. Hurricane Andrew contributed a new dive site on its way through last August. A freighter, the *Bimini Trader*, now rests in 85 feet of water.

At Little Caverns, giant spotlight parrotfish bobbed and weaved through clouds of yellowtails while platter-sized French angels hovered near the openings of some caves nearby. I began to count different species and lost track at 14—or was it 15?

Despite its natural bounty, Bimini still draws divers to its more, ah, cosmic bounty. Blame it on Atlantis, which, according to psychic Edgar Cayce, sank here a few thousand lifetimes ago. Discovered in 1968, the "Bimini Road" is a series of pavement-like stones in about 15 feet of water—said by true believers to be the remains of the continent of Atlantis.

Blue Holes and Hog Trails

A charter plane from South Bimini's matchbox-size airport took me almost due southeast, across the vast Great Bahama Bank. The shallow banks surround all but the eastern rim of Andros—which falls off

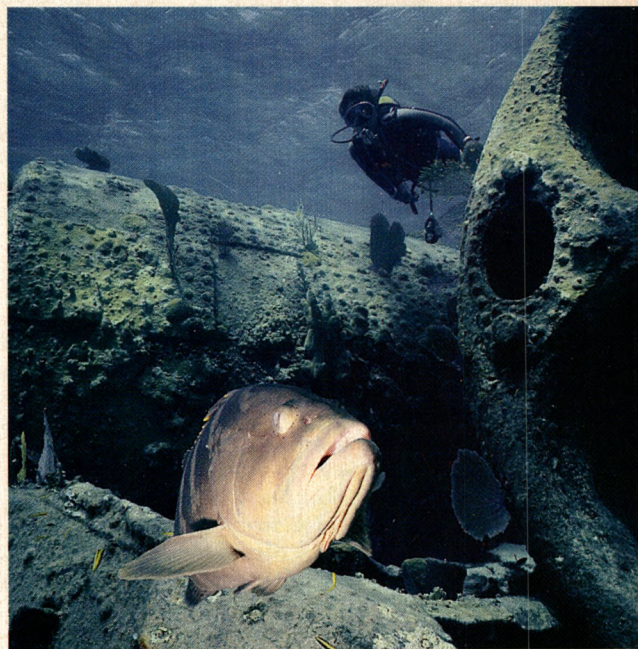
over a mile down into the Tongue of the Ocean. On land, the remains of Loyalist plantations and old logging roads are sometimes criss-crossed by wild hog trails on this sparsely populated island. Later, I discovered the enriched currents from the ocean channel nurture black coral on the walls at only 60 feet.

This island is the Valhalla of blue holes, many of which are accessible to experienced divers with proper training. And, even though a family-owned operation has been exploring these waters for some 34 years, holes are still being discovered.

Just recently, cave diver Brian Kakuk, a diver with the Navy's nearby deep-water testing

A DIVER AND FRIEND CHECK OUT THE FRESCANTE IN SAN SALVADOR (BELOW). CURRENTS AND PLENTIFUL CALCIUM CARBONATE NOURISH THE RICH REEF STRUCTURES FOUND ON THE BAHAMA BANKS.

ALISE & MORT PECHTER, STEPHEN FRANK



Down Island Mojo

BEST CHEESEBURGER IN PARADISE

The Ma Rubi Burger at Tingum Village on Harbour Island. Jimmy Buffett put it on his list of *Best Cheeseburgers*.

MOST BLUE HOLES

We're dealing with nothing but Swiss cheese-like karst islands here, folks, but Andros is the holiest simply because of its vastness—it's over 40 percent of the entire land mass of the Bahamas.

BEST ECO-DIVE

Rosenstiel School of Marine Science grad Ed Haxby at Exuma Fantasea in Georgetown comes armed with slate and fish ID cards and a genuine concern for all things great and small under water.

BEST BAHAMIAN BEER

Kalik, brewed and bottled in Nassau. Head and shoulders above Corona. (It's also the only Bahamian beer, but who's counting?)

REAL FANTASY ISLAND

The Green Turtle Club, where yachting flags fly from the ceiling and the walls of the bar are papered with money while giant Bertram yachts rock tastefully at the dock just outside. *De plane, boss, de plane!*

BEST STUPID PET TRICK

Briland, a dead ringer for Ol' Yeller on Harbour Island, who I saw leap off the dock at the Romora Bay Club and corkscrew some 12 feet to the bottom for the sheer pleasure of retrieving a two-pound lead weight. Dive shop owner Jef Fox actually trained Briland to do this. I love these islands.

BEST HAND-CRAFTED BOATS

Man O' War Cay. The Alburys have been making them here since just after the American Revolution.

BEST PLACE TO WATCH SUNSET

From the hot tub at the water's edge at Small Hope Bay Lodge on Andros. I really love these islands.

MOST POPULAR ANCHORAGE

The 350 boats that were there in February make a good case for Great Exuma's Elizabeth Harbour. Abaco's Marsh Harbour is a close second.

MOST PROMISING NEW DIVE SITES

Cat Island where Italians Massimo Minervini and Alma Cosenza at Fernandez Bay Village are just beginning to explore virgin sites on a sheer wall that runs the width of the island's southern tip. *Bravissimo!*

DIVE RESORT WHERE THE BOATS (AND EVERYTHING ELSE) RUNS ON TIME

The German-owned Stella Maris Resort on Long Island. And you thought *island efficiency* was an oxymoron.

MOST VERSATILE DIVEMASTER

Victor at Romora Bay, who also fills in as horticulturist, shiatsu masseuse, tennis pro and naturopathic doctor. He also dog-sits Briland when necessary. Man, do I love these islands.

BEST CANADIAN AMBIENCE, EH?

Dive Abaco at Marsh Harbour where Keith Rogers and Wayne Thomson have given Skeet LaChance's old business some real northern exposure. Ice down the Molson, you hosers.

BEST VIZ

This is a tough one since the scant development in the Out Islands provides good visibility nearly everywhere. Yet, a unique mix of deep-water ocean currents keep San Salvador waters particularly clear. An honest 200 feet isn't uncommon on good days.

BEST CIVIC SPIRIT

Blaine Sweeting of Dive Odyssey on Abaco who volunteered time to help teach untrained local hookah divers how to stay alive.

PINKEST SAND

Eleuthera. Sea urchin spines, coral, shell and other stuff get ground into little pieces to make it that way.

CLOSEST TIES TO QUESTIONABLE PERIODS IN HISTORY

Bimini, hands down. Here we have Atlantis, sunk just offshore, as well as a swimming hole imbued by former Atlantans with, ah, cosmic powers. The ghost of Hemingway still roams among the vintage photos in the Compleat Angler—the same place where Gary Hart lost it over Donna Rice one raucous, photo-happy night.

facility, began to explore and map the inland Guardian Blue Hole where he finds fossilized sea biscuits and tube worms in the walls. During most dives he is trailed closely by "The Guardian," a landlocked barracuda, tinted an unworldly bronze by a layer of hydrogen sulfide-laden water at the mouth of the hole.

Out on a nearby wall, I headed down to Alec's Cavern through an opening in the coral at 55 feet, maneuvering back through a series of coral chambers dimly lit from natural "skylights" overhead. Inside one nearly black room I turned on my light and found myself surrounded by a thick school of glassy sweepers. I poked through the labyrinth as it wound down to 90 feet. There, I followed a natural chimney all the way up to the top of the coral-covered wall, surprising a school of bright blue-and-gold juvenile hogfish that scattered behind a hedgerow of fluffy sea fans. Tentatively, I poked my head out, coming face to face with thousands of feet of sheer abyss shimmering in a deep, electric blue.

Coral Heads Among the Yachts

The Abacos sprawl northward on the east end of the Little Bahama Bank, a separate plateau it shares with Grand Bahama Island. Like the Exumas, it's a natural harbor for boats, especially sailing craft looking for a friendly anchorage. In addition to the sprawling "mainland" of Abaco, there are a number of smaller cays along the reef, which meanders northward past Green Turtle to Walkers Cay, beyond where the island squeezes into a narrow tip at Little Abaco.

Out on these cays, you'll find what the guidebooks like to call "New England charm"—a blend of early 19th-century architecture and a taciturn style honed from years of self-sufficiency on these tiny tropical isles.

Beyond sailing, diving and feasting on local seafood—fresh conch, lobster, grouper steaks—the other main concern is trying to save the Bahamas Parrot, in danger of disappearing because of habitat loss and poaching for dealers. Flocks of these handsome birds,

with red throats and white heads above bodies of green and blue, still roost in the Abacos, burrowing into the ground to nest.

Walls along most of the Abacos start too deep for sport divers—190 feet or so—but a shallow wall in 50 to 80 feet is now being explored at Cherokee Sound below Marsh Harbour. Otherwise, action here is either out on the reef line or around the 20-odd inland blue holes. The typical inland hole is topped with a layer of fresh water, followed by a haze-inducing halocline belt, and bottomed out with ultra-clear salt water. Their offshore cousins, the ocean holes, are magnets for fish and shellfish, including huge spiny lobster, since the coral-covered walls and ledges provide both food and shelter.

Some of the inland and offshore holes are connected by caves. Not long ago, a researcher injected some non-toxic red dye into the inland hole at Treasure Cay to trace the connections; three weeks later—long after the researcher left—the red dye began leaking from a small hole out on the reef. A fisherman who saw the leak rushed back to the marina to tell everyone the “reef is bleeding.”

A reef line usually means shipwrecks and the Abacos are no exception, from Cherokee Sound all the way up to Walkers Cay. The best known site is probably the *Adirondack*, a Civil War-era ship in 30 feet of water on the back of Man of War Cay. Among its armaments the ship carried Dahlgren guns, and several of them are still visible on the wreck.

Perhaps more interesting, though, is the *Viceroy*, a turn-of-the-century

steamship in 55 feet of water near Chub Rocks. With its engine and props still intact, the site is inundated with schools of snappers and grunts; damselfish flit through the structure, along with four-eyed butterflyfish. Here, too, is “Pickles,” the seven-foot green moray who has become used to hand-outs from divers. Not far away, the wreck of the *San Jacinto* rests in 30 feet

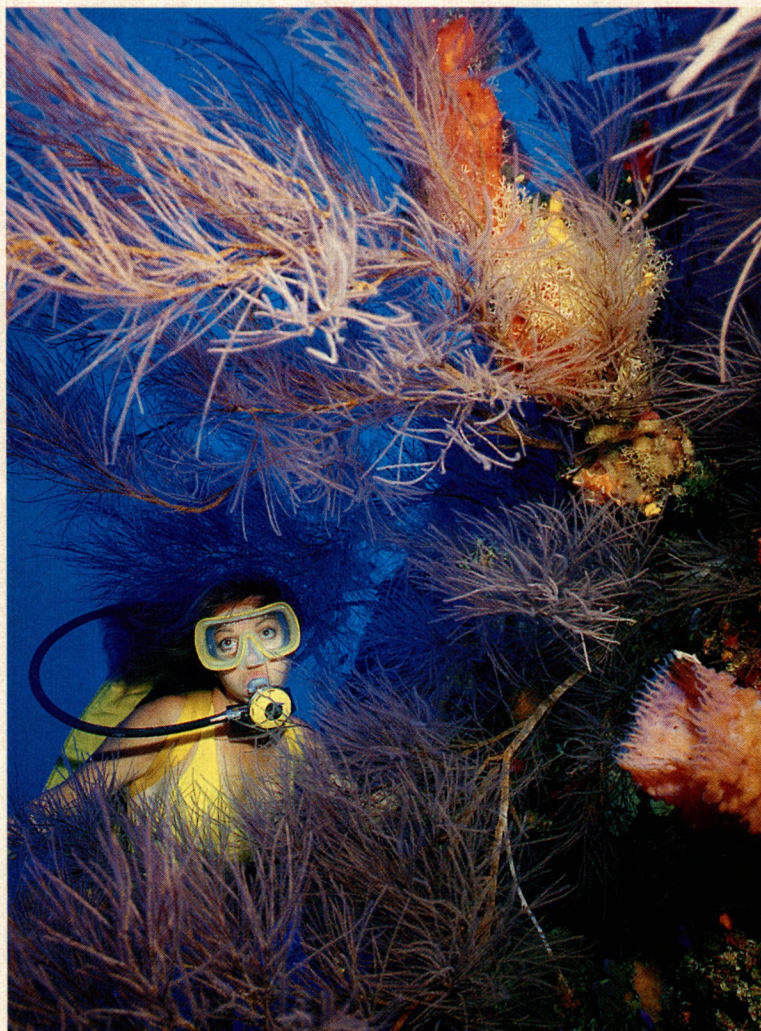
watched a Lilliput-sized secretary blennie play hide-and-seek in the grooves of a brain coral. As I swam back into the caves, a 15-pound Nassau grouper followed along like a puppy. At The Towers, twin mountains of coral threaten the surface from 70-foot depths, awash in blue chromis and schools of butterflyfish.

When the weather is rough, or for

groups looking for a casual shallow dive and snorkel followed by a beach picnic, Pelican Cays Land and Sea National Park is hot. Here, as in other parks, nothing alive or dead can be removed and surface fishing is outlawed to encourage replenishment of marine species, according to park warden Diane Claridge. Pelican Cays is rare because it's the only inshore fringing reef in the Abacos, says Claridge, who's counted 170 different land and sea species there—including green turtles and spotted eagle rays. Working with cetacean expert Ken Balcomb, Claridge also coordinates teams of EarthWatch volunteers to study bottlenose dolphins in the Bahamas. They're helping formulate a marine mammal conservation strategy. Besides a healthy dolphin population, they've also sighted pygmy whales, beaked whales and pilot whales, along with migrating humpbacks.

See How the Main Sail Sets

They tell me if I counted, I would find 365 islands in the Exumas scattered along the eastern leg of the Great Bahama Bank at the edge of Exuma Sound—from tiny Hog Cay in the south all the way up to Beacon Cay in the north. (Continued on page 101)



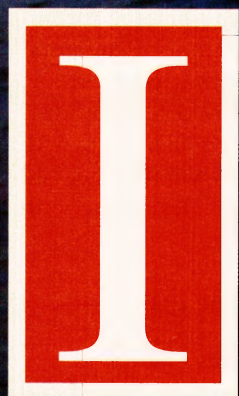
STEPHEN FRANK

of water. At the north end of Great Guana, divers can spend their entire bottom time inside the Catacombs, massive coral caverns in the reef.

On the outer reef just minutes from Marsh Harbour is the Fowl Cay Land and Sea Preserve with its own caves and towering mounds of living coral. There are a number of shallow sites perfect for novice divers. At Maxi Cave Bay, I descended through a school of a hundred-odd small barracuda—which parted like the Red Sea to let me through—and on the bottom, I

POSTCARD FROM

Big sharks, volcanic islands,



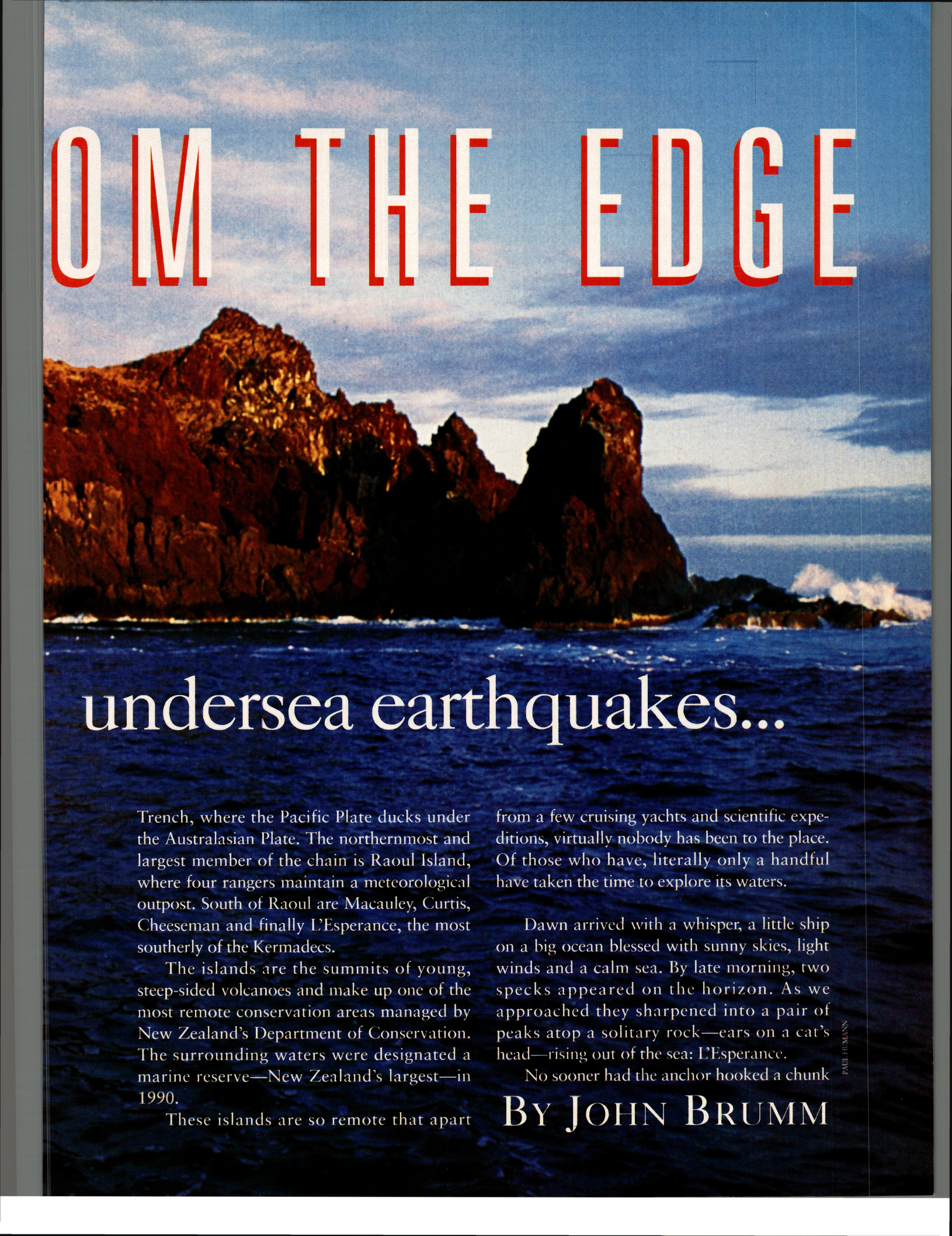
was looking for an adventure that would take me out to the edge of the Earth, somewhere out in Indian country where nature takes no shit off humans and the diving is virgin and E-ticket electrifying. That's when I got a call from a fellow who said he was putting together an expedition to the Kermadec Islands,

located about 600 miles off the coast of New Zealand. I'd never heard of the Kermadecs but figured a group of islands 600 miles from any place was bound to set my neck hairs tingling.

A week later I was riding the lee rail of

Kiwi Diver, a 76-foot former research vessel, awash in the glow of a midnight moon. On board with me were four other Americans, six Kiwis—as New Zealanders call themselves—and a crew of six. We were two nights out of Tutukaka, a tiny harbor on the eastern coast of New Zealand's North Island, steaming northeast toward a cluster of volcanic dust specks dotting the vast southern ocean midway between New Zealand and Tonga. We hadn't seen another ship since leaving Tutukaka.

The Kermadec chain consists of four groups of islands stretching 80 miles along the western ridge of the 9,000-foot deep Kermadec



ON THE EDGE

undersea earthquakes...

Trench, where the Pacific Plate ducks under the Australasian Plate. The northernmost and largest member of the chain is Raoul Island, where four rangers maintain a meteorological outpost. South of Raoul are Macauley, Curtis, Cheeseman and finally L'Esperance, the most southerly of the Kermadecs.

The islands are the summits of young, steep-sided volcanoes and make up one of the most remote conservation areas managed by New Zealand's Department of Conservation. The surrounding waters were designated a marine reserve—New Zealand's largest—in 1990.

These islands are so remote that apart

from a few cruising yachts and scientific expeditions, virtually nobody has been to the place. Of those who have, literally only a handful have taken the time to explore its waters.

Dawn arrived with a whisper, a little ship on a big ocean blessed with sunny skies, light winds and a calm sea. By late morning, two specks appeared on the horizon. As we approached they sharpened into a pair of peaks atop a solitary rock—ears on a cat's head—rising out of the sea: L'Esperance.

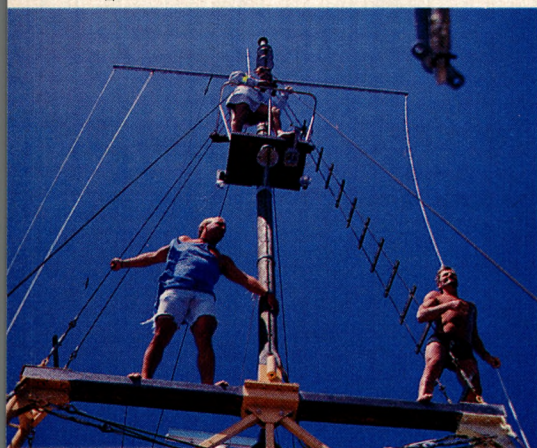
No sooner had the anchor hooked a chunk

BY JOHN BRUMM

of bottom rock than a pack of chattering bottlenose dolphins appeared, leaping and splashing in the clear water—the L'Esperance welcoming committee.

A strong current was running along the cliff face so the chase boat dropped us upstream into a swirling cauldron of white water. Descending uneasily through the bubbles I cleared my mask in time to see three bronze Galapagos sharks racing toward me through the surge cloud. They came in

MARION & JOHN BACON



THE KIVI DIVER CREW SEARCHES FOR PHOTOGRAPHY EQUIPMENT DITCHED BY ONE DIVER CAUGHT OFF GUARD BY AN UNYIELDING CURRENT.

fast and close; by the time they finally veered off I was on the verge of swallowing my regulator.

The locals converged from open water and from the crater-like seafloor. A pack of three-foot kingfish cruised in, tailed by a swarm of bright blue maomaos. Thousands of two-spot demoiselles descended while huge lionfish, speckled morays, blue mokus and notch-head marblefish boldly left the bottom rocks for a closer look at our bubbles and flashing strobes.

Everybody surfaced babbling about the abundant sea life, the vibrant colors and especially the sharks. But this first dive was only an appetizer after the long ocean crossing. The real action waited for us at Raoul, still 13 hours to the north.

Daylight found us approaching Denham Bay on the south shore of Raoul. The morning was clear and markedly warmer as we had crossed into the tropical convergence zone during the night. We dropped

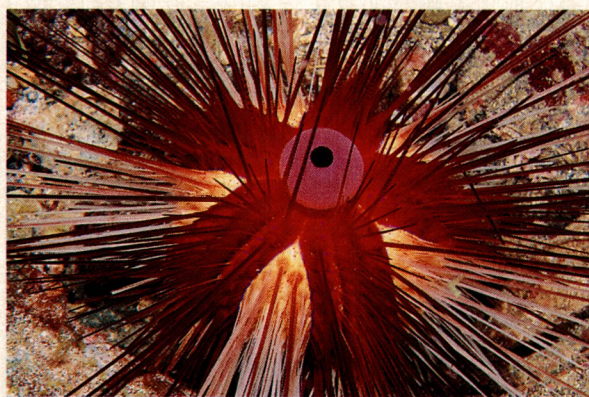
anchor in the southwest corner of Denham Bay and leapt into the water. Once again, we were greeted by Galapagos sharks, about a dozen of them, along with a pair of black-spotted groupers, mating stingrays, loggerhead turtles, swarms of lionfish and ...

KAWHOOOOM!

The sea bottom shuddered, followed by a series of dull thumps, like muffled dynamite explosions. The sharks, groupers and stingrays streaked for cover. We swam for the boat.

Upon surfacing we found that the New Zealand Navy had just radioed the captain, to order us out of Denham Bay. An earthquake measuring 5.0 on the Richter scale had slammed the island earlier that morning and we were now anchored at its epicenter. There was a tsunami alert posted for the eastern coast of New Zealand. Worse yet, the tremors were continuing and weren't getting any weaker.

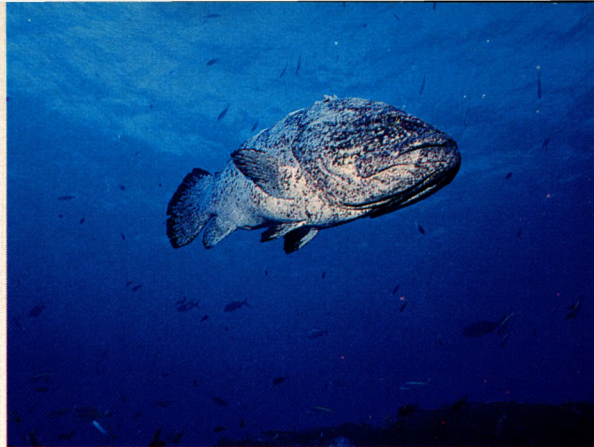
Steaming around to the north side of the island, we learned that Raoul had been rocking and rolling all morning. Idling along the coastline we watched chunks of the cliff face break off and explode in brown clouds on the narrow rock beach. The last time this



NEEDLE-SHARP SPINES PROTECT THIS RED DIADEMA URCHIN.

type of seismic activity occurred was in 1964 when tremors triggered a volcanic eruption that blew a gigantic crater out of the middle of the island. Scientists predicted that Raoul was likely to see a blast of equal or greater magnitude approximately 30 years after the 1964 event. Let's see, 64 plus 30 is ...

Whoaa.



THE RARE BLACK-SPOTTED GROUPER IS COMMONPLACE IN THE KERMADECS.

PAUL HUMANN

So we laid off the meteorological station and waited for instructions. The Navy was considering evacuating the rangers, and since we were the only boat within 600 miles of this island, we'd be doing the evacuating. Needless to say, after spending the last eight hours dodging collapsing pantry shelves and rambunctious furniture, the rangers were eager to take a boat ride.

While the captain waited to hear from the Navy we realized we were about to be ordered back to New Zealand for safety. Facing an aborted dive trip, we did the logical thing—we went diving.

Hordes of bright yellow drummers contrasted sharply with the cobalt-blue water. Golden soft corals, purple sea fans and vibrant yellow, green, orange and pink cup corals adorned the rocks and canyon walls. Black-spotted groupers—rare almost everywhere else in the world—seemed to be holding a convention here.

The constant underwater concussions were nerve wracking. Like salvos from some sunken fleet of battle-

PAUL HUMANN

ships, the jolts of seismic thunder vibrated our bones and squeezed our lungs. By the time we got out of the water a decision had been made. We would pick up the rangers at dusk, steam 10 miles offshore and then heave to for the night. If the island didn't explode in the dark we would return in the morning and put the rangers ashore to gather data and send it off to the mainland. Based on this new information, a deci-

sion would be made as to whether we could stay.

In the meantime, we still had a few hours of daylight so, earthquakes or no, we moved over to Meyer Island and hit the water again.

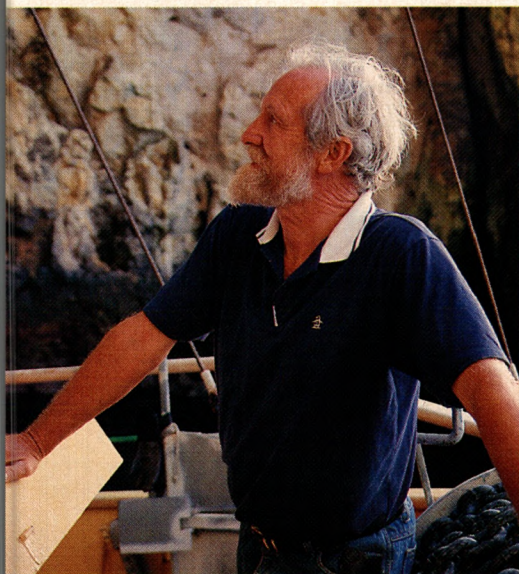
Meyer Island is the kind of place a boat could anchor for three or four days and no one would get bored. We headed off in a half-dozen directions, and when we returned we had a half-dozen completely different but equally exciting tales to tell.

I went straight to the bottom. With *Kiwi Diver* 112 feet above me looking as if it were floating on air, I took off over a salt-and-pepper colored sand channel that wound through a volcanic canyon.

Swimming past dramatic overhangs weighed down with black coral, the walls of the shallow caves exploded in greens and yellows and oranges. Nestled in the dark crevices I found families of boarfish and a gold ribboned grouper. A pride of lionfish appeared from the shadows and followed in my fin wake. Out in the distance, a solitary shark tracked my movements.

Excepting the occasional gut-wrenching concussion, the rumblings

"WE'VE BEEN TRYING VERY HARD TO SCHEDULE A DULL MOMENT ALL AFTERNOON."



didn't seem as severe out here. Or maybe I was getting used to them.



BLACK SAND AND DRAMATIC CLIFFS ARE TYPICAL OF BEACHES IN THE VOLCANIC KERMADEC ISLANDS.

Sundown. The four rangers shoved off from shore in a yellow inflatable and joined us for a barbecue. *Kiwi Diver* pulled anchor and headed for open water.

About midnight the ocean got grumpy. The seas rose and the boat rolled wildly in heavy swells. We tucked ourselves tighter in our bunks and held on, but the poor rangers, in sleeping bags out on deck, spent the night gripping the gunwales and regurgitating, overwhelmed by *mal de mer*.

Just before dawn they dragged themselves to the pilothouse and begged the captain to take them back to the island. Getting up to see what all the commotion was about, we graciously declined the invitation to join them in their escape from this hellship, and instead filed into the galley to grab some breakfast.

The fear that we'd be run out of the islands prompted everybody to hit the water early. On our first dive we didn't see many fish and the sharks were conspicuous by their absence. But the underwater rumblings weren't nearly as intense as they were yesterday. A good sign.

By late morning we still hadn't heard from the Navy. So while the rest of the team went diving off the swim step, a few of us grabbed fresh tanks and piled into the chase boat to check out a reef between Meyer and a nearby islet named Napier.

We descended onto a spectacular plateau about 50 yards wide and 30

feet below the surface. Sheer walls dropped straight down to well over 150 feet, catacombed with majestic arches and caverns crowded with black-spotted groupers, big scorpionfish and other animals clearly startled by our presence.

I was inside one of these shallow depressions eyeballing a mosaic moray when the current hit. It rose suddenly, rushing through the channel between the two islands with the force of a bursting dam. It grabbed me out of the cavern and thrust me upward, sending my computer ascent alarm into beeping hysterics.

Reaching the top of the reef I decided to cross the plateau and drop down the other side, thinking that would protect me from the current. Crawling slowly, deliberately, not wanting to lose my grip and get flushed off the reef, I approached the edge, my

PAUL HUMANN

MARION & JOHN BACON



TWO-SPOT DEMOISELLES HOVER OVER A LONE CORAL COLONY.



ANCHORED TO A GORGONIAN, A FEATHER STAR
USES ITS ARMS TO SWEEP THE WATER FOR FOOD.

PAUL HUMANN

confidence growing. I was just about to make it when something rose up from the depths, grabbed my tank yoke and jerked me over the side.

Rocketing head first into Davy Jones's Locker, frantically equalizing my ears with one hand, breaking off pieces of reef with the other, my depth gauge reading 40 ... 50 ... 75 ... 85 *you better do something boy!*

At 95 feet the current slacked enough for me to grab a piece of reef and hold on. Taking a moment to collect my wits, I figured I'd had enough fun on this dive.

I climbed back up the wall. When I reached the plateau I looked up at the surface and saw the bottom of the chase boat—yes! Then I watched the

chase boat take off without me—*no!*

I knew if I let go of the reef the current would give me a free ride to Antarctica. So I figured I'd just hold on for a while. The boat would be back for me. And at 30 feet, the reef top was a good place for a safety stop. So I hung there, flapping in the current like a damp flag, and waited to be rescued.

And waited. And waited. Air supply getting a bit low. The current's trying to rip off my face mask. I had just started humming to myself to pass the time when an eight-foot Galapagos shark eased in from the blue water to have a look at me.

Well, isn't *this* special? Vicious current, no chase boat, no air and a shark who seems to understand my predicament perfectly. I couldn't imagine what could possibly happen to make this picture any bleaker.

KAWHOOOOM!

The concussion liquefied my insides. I lost my grip on the reef, surrendered to the current and slowly ascended. Pulling a safety sausage from my BC pocket, I had resigned myself to a long surface interval adrift on an empty ocean when I broke surface and found the chase boat bearing down on me.

As it turned out I wasn't the only one having an adventure. The rogue current had scattered the group, especially one Kiwi and one Yank who ended up drifting for an hour surrounded by a school of sharks.

I was hanging my wetsuit on the starboard rail when I saw the captain looking sort of haggard leaning out of the pilothouse window, staring at the horizon, no doubt thinking about earthquakes and volcanic eruptions and divers adrift on the open ocean.

"Never a dull moment, huh skipper?"

The captain sighed and in his English accent replied drolly, "Actually, we've been trying very hard to schedule a dull moment all afternoon."



Wonderful news. The seismic activity was on the wane and the Navy said we could stay.

That night over dinner the chief engineer announced that *Kiwi Diver* was big news back in New Zealand. This earthquake business had caused quite a stir and the press had been reporting that *Kiwi Diver* was out here braving all sorts of dangers to rescue the "Rangers of Raoul."

Never mind the fact that even if we put a speargun to their heads there was no way we could "rescue" those rangers if it meant they had to get back on this boat. Still, gathered around the salon table gobbling peach pie and drinking hot cocoa, getting ready to climb into our jammies and watch a movie on the VCR, we were all feeling pretty damn macho.

Next morning we made another dive at Napier before steaming over to the northwest end of Raoul and dropping anchor on a sand flat in 60 feet of water. *Kiwi Diver* owner Mick Courtneil had a good feeling about this spot,

in spite of the fact that everyone else was laying bets it would turn out to be a wasted dive. Waving off the hoots and heckles, Mick suited up and dropped over the side.

He was back on the boat in 20 minutes, smiling like a Cheshire cat. Without any explanation Mick pointed toward the bow, told us to swim about 50 yards and keep our eyes open.

Sliding down the anchor line we spied a pair of sharks in the 125-foot visibility. Then we saw another pair. Off to our left a pack of 10 sharks swam in; off to our right came a dozen more. We were surrounded by sharks. Hundreds of them, ranging in size from three to six feet long, swam lazy circles over a magic kingdom rising out of the sandy plain.

It was a long sweeping coral-covered reef made up of huge stones, some of which were so symmetrical they looked like the ruins of a lost civilization. The nooks and crannies were inhabited by a bustling community of black-spotted groupers, gray and mosaic morays, golden snappers, scorpionfish, lionfish, yellow-banded perch, pink maomaos, silvery kingfish, schools of striped mados, two-spot demoiselles, blue mokus too numerous to count, reef pigfish, combfish and sandager's wrasses. And patrolling this underwater oasis were more sharks than any of us had ever seen at one time, in one place, in our entire lives. They weren't aggressive, nor were they shy. They were simply curious, and this curiosity brought them so close we could have easily reached out and touched them.

Video cameras hummed and strobes fired with abandon. Everyone agreed: This was the stuff legends are made of. We had crossed an ocean, dropped onto a spot no one had ever dived before, and we had scored—scored big. Never mind what happened before or what might happen after,

this one dive made the trip worthwhile.

We named it Red Gull Reef because of an impression of a giant gull, wings outstretched, etched into the cliff face on shore.

On our last day at Raoul we dived the Herald Islets, a string of craggy rocks seaward of Meyer Island, and made a goodbye dive at Red Gull Reef. Finally, we swung over to Denham Bay and enjoyed a quiet dive with three sharks. Then it was over.

Sitting on the sundeck offgassing in the lee of the Heralds it was hard to believe that we would be leaving Raoul at sundown. We had consumed this week like we had wolfed down that barbecue on shore last night. It had been all the more tasty knowing that we were among only a handful of divers who'd ever visited these waters. We weighed anchor and set a course back to L'Esperance and ultimately to New Zealand.

Force five winds and 15- to 20-foot cresting seas charging in off our beam slapped *Kiwi Diver* around like a bathtub toy. Rivers of green water rushed down the side decks and swept

over the pilothouse. Rolling from gunwale to gunwale, pots and pans crashing, "breakfast will be served on the galley floor."

We'd been maintaining white-knuckle grips on our bunks and our coffee mugs for a day and a half, and we were still 150 miles from Tutukaka Harbor. But hey, if it was easy to get to the Kermadecs everybody would be doing it. Wiping dinner stew off our shirts, we figured the rough weather and long ocean voyage were the barricades that kept the Kermadecs fresh, kept the diving truly virgin.

The Kermadecs aren't for everybody. You need a good pair of sea legs and a cast-iron constitution, you've got to be satisfied with unpredictable weather and water conditions, be comfortable diving in currents and surge and being in the water with sea creatures, including lots—repeat *lots*—of sharks. You need to be prepared to pay your money and take your chances, because with trips like these there are no guarantees.

That's how it is out in Indian country. 

John Brumm is the West Coast editor of Rodale's Scuba Diving. He's still getting the stew stains out of his shirts.

Dive In

GENERAL INFORMATION: The Kermadec Islands comprise four groups of islands, islets and rocks located approximately 600 miles off the coast of North Island, New Zealand.

CLIMATE: Sub-tropical. Best time of year to visit is from February to May, when surface temperatures range from 79F to 88F.

CURRENCY: The New Zealand dollar, currently exchanged at \$1 US to \$1.83NZ.

Credit cards and American Express travelers checks are also widely accepted.

LANGUAGE: English.

DOCUMENTS: A valid passport.

WATER CONDITIONS: Visibility ranges from 100 to 140 feet; water temperatures from 73F to 80F. Most divers wear 3/16-inch wetsuits without hoods.

GETTING THERE: Air New Zealand and United offer nonstop flights from Los Angeles to Auckland. Continental and Qantas also fly to Auckland through Honolulu. Depending upon lead time and time of year, round-trip air fare can range from just under \$900 to over \$2,100. U.S. travel agents can usually get the best rates on airfare to New Zealand.

ACCOMMODATIONS: The 76-foot *Kiwi Diver* offers 14-day dive expeditions to the Kermadec Islands, with intermediary stops at the Poor Knights Islands, that include 10 days of diving for about \$1,900 U.S. *Kiwi Diver* carries up to 12 divers with a crew of six.

MORE INFORMATION: U.S. contact—See & Sea Travel, 50 Francisco St., Suite 205, San Francisco, CA 94133, 1-800-DIV-XPRT; fax: (415) 434-3409. New Zealand contact—Dive & Fishing Consultants, Box 36-338, Northcote, Auckland 9, New Zealand, 011-649-479-2210, fax: 011-649-479-2214.







RAREFIED

Air

**WHO'S THE
FAIREST OF THEM
ALL? OUR TEST
SETTLES THE
QUESTION BY
RATING THE HIGH-
PERFORMANCE
REGULATORS.**

**By JON HARDY &
BARRY SHUSTER**

If you've been following along in your hymnals, then you've already read our reviews of budget (*March/April 1993*) and midpriced regulators (*June 1993*). Many of these models had never been tested for publication, and we found that there isn't a direct one-to-one relationship between price and performance.

This time out, we issued the ultimate challenge by testing the industry's "high-performance" regulators, ones with suggested retail prices above \$401.

We rated the regulators either 1 (outstanding), 2 (good) or 3 (adequate) in terms of their performance under normal, demanding and extreme diving conditions and also graded for comfort and ease of use. A perfect score would be 4 and the worst score would be 12.

All of the regulators we tested—in all three groups—will serve you well for general recreational diving, but some definitely provide higher performance. If you plan to dive deep, work hard under water, or if you don't give your gear much in the way of TLC, you may want to focus on regulators with an "outstanding" combined total of 4, 5 or 6 rather than an "adequate" combined score of 10, 11 or 12.

Our testing wasn't done under ideal conditions (as are the U.S. Navy tests) but rather under *typical* conditions, as you would use your regulator. All models were checked and prepared to ensure they were operating within factory specifications. Each regulator was then dived under carefully controlled conditions five times to a depth of 10 meters (33 feet), and thoroughly washed

afterward. Finally, each was tested on a breathing machine under exactly the same set of conditions. These regulators did sit for some time between each major event—arrival from the manufacturer, prepping, ocean tests and machine tests—just as your own regulator would sit between uses.

The breathing machine ran every regulator at all combinations of six, 15 and 25 breaths per minute of three liters each; at 500 and 1,000 psi supply (tank) pressure; and at the surface, 66 feet (20 meters) and 131 feet (40 meters), plus, for this group of high-performance regulators, at 197 feet (60 meters). Regulators with diver-controlled adjustments were tested at each extreme setting.

The breathing machine measured initial breathing resistance, midinhalation effort and midexhalation effort and then compared them under several different sets of conditions.

These conditions were selected to fairly represent recreational diving. What we refer to as *normal* conditions means easy, general recreational diving at 66 feet with a 1,000 psi supply pressure and 15 breaths per minute. *Demanding* conditions indicates a relaxed diver breathing at 15 breaths per minute with 500 psi supply pressure at the end of a dive and at the gen-

erally used maximum recreational limit of 131 feet. *Extreme* conditions refers to a diver under stress who may over-breathe the regulator at 25 breaths per minute, at 131 feet and 500 psi supply pressure. And for *technical diving* conditions, we simulated a relaxed tech diver at the end of a dive about to ascend to decompression stops: 15 breaths per minute with 1,000 psi supply pressure at 197 feet.

Now Featuring...

We expanded our standard regulator feature chart to better explain these complex high-performance regulators.

Manufacturers have many names for the devices in the second-stage housings that are intended to make breathing easier. No matter the brand name or appearance, the function is the same: a venturi-like method of accelerating air into the diver's mouth. We call this an *assist*. Some of these assists can be controlled by the diver, usually with a simple switch called an *adjustment*. Turning the assist off makes the regula-

No No Navy

For years Poseidon, Scubapro and U.S. Divers regulators have placed at the top of the U.S. Navy's performance groups on breathing machine tests. Our tests put Dacor, Mares and Scubapro at the top of the list. Reasons for this difference may include that our breathing machine tests are designed to cover recreational rather than military diving conditions, that our open-water tests are far more extensive than the Navy's, that our breathing machine tests are conducted after our open-water tests, that some of these regulators weren't available when the Navy last did their testing, and that some of these regulators have been greatly improved in recent years while others haven't.

tor breathe harder. Divers often detune their alternate second stages to keep them from free flowing, or adjust their primary regulator to keep it from free flowing at the surface.

A more common adjustment is made by turning a dial on the left side of the second stage. This controls breathing resistance by changing how difficult it is to move the lever between the diaphragm and the valve in the second stage. Most of these adjustments have a range of between three and 11 turns and will vary from hard breathing to a slight free flow. The optimum setting can be achieved by opening the adjustment all the way and then backing off just enough to keep the regulator from free flowing.

Resistance dials can be useful. As you go deeper or breathe harder you can dial to an easier breathing position, and when in odd swimming positions the unit can be adjusted to provide easier breathing or to prevent free flows as needed. You can also make the regulator "stiffer" or harder to breathe when swimming into a current or through surf—which tend to depress on the diaphragm and cause free flows—or while snorkeling. Used as an octopus, an adjustable second stage can be

FEATURES

Regulator	Swivel	1st STAGE		HOSE		2nd STAGE	Sug. Ret. Price
		Type	Ports	Length	Outside Diameter	Second Stage	
Apollo Prestige 102	No	Balanced diaphragm	HP-2/LP-2+2	27"	1/2"	Downstream with assist and one adjustment	\$473
Apollo Prestige 105	No	Balanced diaphragm	HP-1/LP-3	27"	1/2"	Downstream with assist and one adjustment	\$495
Dacor Extreme	No	Diaphragm-assisted piston	HP-2/LP-4	27"	1/2"	Balanced downstream with assist and two adjustments	\$420
Dacor Extreme Plus	Yes	Diaphragm-assisted piston	HP-1/LP-4	27"	1/2"	Balanced downstream with assist and two adjustments	\$440
Mares MR12DFC Navy	No	Balanced diaphragm	HP-1/LP-5	30"	1/2"	Downstream with assist and no adjustment	\$426
Mares MR12DFC Voltrex	No	Balanced diaphragm	HP-1/LP-5	30"	1/2"	Downstream with assist and no adjustment	\$494
Parkway Cyklon 5000	No	Balanced diaphragm	HP-1/LP-4	28"	1/2"	Downstream with assist and no adjustment	\$520
Parkway Odin	No	Balanced diaphragm	HP-1/LP-4	28"	1/2"	Balanced upstream with assist and one adjustment	\$500
Scubapro MK10 G250	Yes	Balanced piston	HP-2/LP-5	32"	7/16"	Balanced downstream with assist and two adjustments	\$429
Scubapro MK10 D350	Yes	Balanced piston	HP-2/LP-5	32"	7/16"	Balanced downstream with assist and one adjustment	\$466
US Divers Micra	No	Balanced diaphragm	HP-2/LP-4	27"	1/2"	Downstream with assist and one adjustment	\$470
US Divers SEA2	No	Balanced diaphragm	HP-2/LP-4	27"	1/2"	Downstream with assist and no adjustment	\$400

turned down to prevent air loss and then opened up if needed. You can also adjust for the decreased performance of the regulator between overhauls, and leaving it in the easy-breathing position during storage will help make the second-stage valve seat last longer.

The Rundown

These regulators are grouped by manufacturer, as each company submitted two different models for review. Unlike our earlier tests, models from each manufacturer gave similar performances.

APOLLO PRESTIGE A-102 AND A-105

Open-water testing proved these to be dry breathers and easy to clear; general comfort was their weakest area. On the breathing machine, both emerged as middle-of-the-road performers, with the more expensive A-105 getting slightly lower scores.

The big difference between these two: the A-105 has a charcoal filter and humidifier between the first and second stages. A humidifier is intended to decrease "dry mouth," while the filter is designed to remove particles from the air you breathe. No other manufacturer offers either of these devices, but remember that a humidifier shouldn't be used in extremely cold water due to the possibility of "freeze-up."

Apollo recommends that users disassemble and service the humidifier and filter themselves. The humidifier should probably be serviced after each day of diving and the filter should be looked at after every 15 to 20 tanks of air. The owner's instructions warn users to perform this service carefully in order to avoid difficulties. As a rule, we don't believe it's appropriate for the general diving public to service life-support equipment.



PERFORMANCE

Regulator	Normal Diving Conditions	Demanding Dive Conditions	Extreme Diving Conditions	Ocean Performance with Divers	Totals
Apollo Prestige 102	2	2	2	1	7
Apollo Prestige 105	2	2	3	2	9
Dacor Extreme	1	1	1	1	4
Dacor Extreme Plus	1	1	1	1	4
Mares MR12DFC Navy	1	1	2	1	5
Mares MR12DFC Voltrex	1	1	1	1	4
Parkway Cyklon 5000	2	2	3	1	8
Parkway Odin	2	2	2	1	7
Scubapro MK10 G250	1	1	1	1	4
Scubapro MK10 D350	1	1	2	1	5
US Divers Micra	2	2	3	1	8
US Divers SEA2	2	2	3	2	9

* 1 = outstanding, 2 = good, 3 = adequate. Lower total score indicates better performance.

DACOR EXTREME AND EXTREME PLUS

These Extremes are top-notch regulators. Dacor's lower-priced units received only average marks in our earlier tests. But Dacor responded to customer feedback and their own testing and made changes to the through-the-diaphragm exhaust and the second-stage housing that helped make average regulators outstanding. If you bought a Dacor regulator before this year, consider having it upgraded; there's nothing unsafe about the older ones, but the recent improvements make them a real joy to use.



In open-water testing the Extremes were comfortable, dry, easy-breathing and performed well in all swimming positions. On the breathing machine they received outstanding marks across the board. Note that when these regulators are dived deep or when breathing becomes rapid the exhale resistance increases more sharply than the inhale resistance and they have a tendency to free flow; this can be adjusted easily.

Two swivels on the first stage of the Extreme Plus make the hoses very easy to position. The Extreme doesn't have swivels, but its ports are angled in such a way that we didn't have any difficulty positioning the hoses on it, either. As has been traditional with Dacor, the first stages are large and heavy, but due to their horizontal, across-the-valve orientation this isn't a concern.

While the switch that prevents free flows is difficult to use, particularly while wearing gloves, this is also true of most other manufacturers' models that use this type of switch. And if you use the purge to clear the regulator, be careful—the force of the purge is dramatic. In general, with all regulators, it's better to clear by blowing.

These regulators use a modular diaphragm-assisted piston with a pressure compensating system on the first stage; as you go deeper the delivery

The Best of The Best

Four regulators in this top-end group received the best possible scores; alphabetically, they are the Dacor Extreme, the Dacor Extreme Plus, the Mares MR12 DFC Voltrex and the Scubapro MK10 G250. Closely following were the Mares MR12 DFC Navy and the Scubapro MK10 D350. Using our same scoring system, we set up yet another set of test conditions for the technical diving community (15 bpm at 1,000 psi and 197 feet). The results of these tests showed that the Dacor, Mares and Scubapro models all rated "outstanding," while the Apollo, Parkway and U.S. Divers units ranked "good."

What Do "+" and "-" Mean?

One problem with emerging technology is that often an innovation becomes useful and valued before we figure out a consistent way to name, use or describe how it works.

So it is with regulator adjustments. For example, on Dacor regulators turning a dial or switch toward the "+" symbol means increased breathing resistance (harder to breathe), while on Scubapro models the same turn will give you an increased flow of air (easier to breathe). So far, one constant is that on the dial type of adjustment, they all breathe easier if you turn them counterclockwise (away from you) regardless of the "+," "-", arrow direction or arrow size.

On the switch type of adjustment, the same +/-, min/max definition problem exists—and here there's no consistency at all as to direction. Some switches go up and down, some sideways and some toward or away from the diver. You need to look at the indicator—often difficult to find and just as hard to read—and then ask yourself what it means.

The solution? Either use non-adjustable regulators or buy your own regulator, familiarize yourself with all its functions and take it along on all your dive trips.

pressure to the second stage is increased, thereby improving performance. The modular design also makes the first stage easier to service.

MARES MR12DFC NAVY AND VOLTREX

Mares also has top contenders. Along with their lower-cost cousins, these models are based on a tried-and-true design. But when we tested the budget-priced Beta its overall score was average, and the midrange MR12III was adequate. However, our tests show that the Navy and Voltrex are clearly outstanding.



These two compact models did very well

during the open-water tests; they breathe easy and dry and they clear nicely. Both these models also proved extremely stable on the breathing machine under all conditions; they breathe well and consistently with very little flutter (variation), no free flows and few, if any, off-scale readings.

These are the only units among the top six that don't have diver-controlled adjustments, so if that's your preference one of these regulators is for you. The biggest difference between the two is

that the Voltrex has a metal second stage, a rarity in today's world of high-tech plastics.

PARKWAY CYKLON 5000 AND ODIN JETSTREAM

These regulators have been made by Poseidon for some years and are now distributed by Parkway in the U.S. Both the Cyklon and the Odin have reputations for being high performance regulators. On the breathing machine we expected these two to be at or near the top of the heap—they weren't. It appears recent improvements made by other manufacturers have pushed the performance of their regulators past these two workhorses.



Both use higher intermediate pressures and deliver greater volumes of air to the second stages than most other models tested.

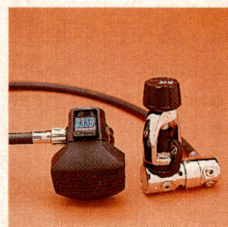
Yet both tend to be unstable, with a great deal of flutter during inhale and greater resistance during exhale under extreme conditions.

During open-water testing both regulators were dry and consistent breathers in all positions. The human testers gave the Cyklon higher scores

for ease of breathing and less bubble interference while they reported the Odin was more comfortable.

Both of these regulators' second stages will work in the right or left orientation and there's no right side up problem when sharing air. Both have side exhausts that go through or around the edges of the demand diaphragm.

The Odin Jetstream is the only servo-assist upstream tilt valve second stage we tested. This design requires a safety bleed in the hose in case of an overpressure between the first and second stages.



SCUBAPRO MK10 G250 AND MK10 D350

Both Scubapro models made our Best of the Best list.

The MK10 G250 outperformed all regulators in all three groups on the breathing machine. It does tend to free

flow, but this can be handled easily using the adjustments. The MK10 D350 was outstanding but didn't perform quite as well when pushed to extremes. The results were very similar to the Dacor Extreme units, with increased exhale resistance and a tendency to free flow under extreme conditions.

Looking at individual open-water scores, the D350 was the easiest to breathe and clear in this group, and it tied with the Dacor Extremes for most comfortable. The G250 wasn't tops in any one area, but scored well all around. However, neither of these Scubapro units does a good job of keeping exhaust bubbles out of the field of view.

The adjustment switch on the G250 is difficult to find and use, but the Pre Dive/Dive switch on the D350 is a cinch. Scubapro supplies special hoses with these. While they have an outside diameter of 7/16", these are high flow hoses with greater inside diameter (Continued on page 97)

UPDATE



AFTER BEING OVERWHELMED BY THE WALLS,
YOU CAN HITCH UP A HAMMOCK AND SNOOZE
AWAY THE AFTERNOON ON SEVEN MILE BEACH.

The Cayman Islands

If you like to follow in the footsteps of Hollywood *sous marine*, you've dived the wreck of the *Constellation* in Bermuda (prototype for the *Goliath* in *The Deep*), and you've seen the James Bond wrecks in Nassau. Now add Grand Cayman to your itinerary. The filming of John Grisham's blockbuster bestseller *The Firm* brought stars Tom Cruise and Gene Hackman to the sapphire blue waters surrounding the Cayman Islands last winter. With the movie just opening, folks who haven't yet visited may be making their reservations at one of the many dive resorts on Grand Cayman or in Cayman

Brac or Little Cayman 90 miles northeast.

The Cayman Islands continue their reign as one of the Caribbean's most formidable dive meccas. More than 60,000 divers a year traipse across the tarmac of Owen Roberts Airport and down to the docks for departures to perennial favorites like Bonnie's Arch, Eden Rocks, Tarpon Alley and Stingray City.

Not much has changed since we did our cover story last August—and that's good news. If you've been here before, you can expect the same consistently clear water, thriving coral and plentiful marine life you saw last time. You *will*

SMOOTH OPERATORS: Choice Dive Deals In The Cayman Islands

	Primary Dive Areas	Specialties/Services	Boats/Divers	Morning Dive	Afternoon Dive	Snorkeling
Ambassador Divers (809) 949-7577 fax: (809) 949-7050	North Wall West Wall Stingray City	computer diving night diving	25: 10 divers 20: 4 divers	1 dive/\$50 departs 8:30 am	1 dive/\$50 departs 1 pm	\$30
Aquanuts Grand Cayman (809) 945-1990 fax: (809) 945-1991	North Wall West Wall South Side	personalized services specialty courses night diving	32: 16 divers 21: 10 divers	2 dives/\$50 departs 8:30 am	2 dives/\$50 departs 1:30 pm	yes
Ashton's Scuba View (809) 949-4142 fax: (809) 949-2549	Jimmy Wall Big Tunnel Trinity Caves	personalized services handicapped divers program special dive sites	36: 15 divers 28: 8 divers	2 dives/\$50 departs 9 am	1 dive/\$40 departs 2:30 pm	\$25-\$35
Beach Club Hotel & Dive Resort (809) 949-8100 fax: (809) 947-5167	North Wall West Wall South Side	night diving environmental courses personal tours	45: 20 divers 39: 10 divers	2 dives/\$50 departs 9 am	1 dive/\$35 departs 2 pm	\$25
Bob Soto's Diving (809) 949-2022 fax: (809) 949-8731	North Wall West Wall South Side	daily resort course full video services specialty courses	(4) 37'-43': 20 divers (3) 30'-32': 12 divers	2 dives/\$55 departs 9 am	1 or 2 dives/\$40-\$55 departs 2 pm	\$20
Captain Marvin's Aquatics (809) 947-4590 fax: (809) 947-5673	North Wall West Wall Tarpon Alley	specialty courses night diving wreck diving	34: 12 divers 29: 6 divers	2 dives/\$50 departs 8:30 am	1 dive/\$50 departs 2 pm	\$25
Cayman Diving Lodge (809) 947-7555 fax: (809) 947-7560	East End The Three Sisters Tunnel of Love	special dive sites specialty courses	45: 20 divers 31: 12 divers	2 dives/\$55 departs 8:30 am	1 or 2 dives/\$40-\$55 departs 1:30 pm	\$15
Cayman Diving School (809) 949-4729 fax: same	Devil's Grotto Seaview Reef Turtle Wall	specialty courses low-cost private instruction multilingual personnel	none	shore dives/\$25 departs hourly	shore dives/\$25 departs hourly	\$5
Cayman Kai Resorts Ltd. (809) 947-9055 fax: (809) 947-9102	North Wall Stingray City	night diving handicapped divers program instructor development	36: 20 divers 32: 16 divers 26: 12 divers	2 dives/\$45 departs 9:30 am	1 or 2 dives/\$30-\$45 departs 2 pm	\$20
Cayman Marine Lab (809) 947-0849 fax: (809) 947-5586	North Wall West Wall South Side	small groups special dive sites marine ID courses	26: 10 divers 26: 8 divers	2 dives/\$55 departs 8 am	2 dives/\$55 departs 1 pm	no
Dive Inn Ltd. (809) 949-0321 fax: (809) 949-8729	North Wall West Wall Stingray City	small groups personalized services computer diving	38: 12 divers	2 dives/\$55 departs 8:45 am	1 dive/\$40-\$45 departs 1:45 pm	\$25
Dive Time (809) 947-2339 fax: (809) 947-3308	Ghost Mountain The Pedro Drop-off Jeff's Wall	special dive sites night diving small groups	40: 12 divers 28: 6 divers	2 dives/\$50 departs 9 am	1 dive/\$35 departs 2 pm	\$25
Don Foster's Dive Cayman (809) 947-5132 fax: (809) 947-5133	North Wall West Wall South Side	night diving photo instruction specialty courses	(2) 58: 24 divers 56: 22 divers 42: 20 divers	2 dives/\$55 departs 9:30 am	1 dive/\$35-\$45 departs 2:30 pm	\$25
Eden Rock Diving Center Ltd. (809) 949-7243 fax: (809) 949-0842	Eden Rocks Devil's Grotto	shore diving specialty courses resort courses	none	shore dives/\$20 by request	shore dives/\$20 by request	\$8
Fisheye of Grand Cayman (809) 947-4209 fax: (809) 947-4208	North Wall West Wall South Side	photo/video courses personalized photo shoots small groups	30: 12 divers 26: 14 divers 23: 6 divers	2 dives/\$55 departs 8:30 am	1 dive/\$40 departs 1:30 pm	\$25
Parrot's Landing (809) 949-7884 fax: (809) 949-0294	North Wall East Wall Stingray City	other water sports personalized services	(2) 45: 20 divers 34: 14 divers (2) 28: 6-10 divers	2 dives/\$55 departs 8-8:30 am	2 dives/\$55 departs 1 pm	yes
Peter Milburn's Dive Cayman Ltd. (809) 947-5770 fax: (809) 947-5786	West Wall North Wall South Side	personalized services marine environmental lectures night diving	36: 14 divers 32: 10 divers 26: 8 divers	2 dives/\$50 departs 7:30 am	1 dive/\$40 departs 12:30 pm	\$20
Quabbin Dives Ltd. (809) 949-5597 fax: (809) 949-4781	North Wall West Side Stingray City	computer diving handicapped divers program personalized services	52: 26 divers 45: 26 divers 36: 12 divers	2 dives/\$50 departs 8 am	by request at divers' convenience	\$25
Ralphie's For the Love of Diving (809) 949-3099, 1-800-453-8984 fax: (809) 949-3822	Eagle Ray Pass Main Street Orange Canyon	night diving personal tours handicapped divers program	(2) 40: 14 divers 28: 6 divers	2 dives/\$55 departs 9 am	1 or 2 dives/\$55 departs 1:30 pm	\$25
Red Sail Sports (809) 947-5965 fax: (809) 947-5808	North Wall West Wall Stingray City	handicapped divers program night diving private instruction	(2) 45: 24 divers 35: 12 divers	2 dives/\$55 departs 8:30-9:15 am	1 dive/\$40 departs 1:30-2:15 pm	\$20-\$25
Rivers Sport Divers (809) 949-1181, 1-800-733-4836 fax: (809) 949-1296	Stingray City North Wall West Wall	handicapped divers program small groups personalized services	36: 14 divers 32: 10 divers	2 dives/\$50 departs 8-8:30 am	1 or 2 dives/\$50 departs 1:30 pm	\$20
Seasports (809) 949-3965	North Wall West Wall South Side	small groups free pick-up along 7 Mile Beach	(2) 24: 7 divers	2 dives/\$38 departs 9 am	1 dive/\$27 departs 1:30 pm	\$20
Sunset Divers Ltd. (809) 949-7577 fax: (809) 949-7050	North Wall West Wall East End	computer diving night diving Cathy Church's photo center	(2) 45'-46': 20 divers (3) 36': 18 divers 32: 14 divers	2 dives/\$55 departs 8:30-9:15 am	2 dives/\$55 departs 1:30 pm	\$10
Surfside Watersports (809) 949-6880 fax: (809) 949-8639	North Wall West Wall South Side	personalized services specialty courses night diving	42: 20 divers 38: 20 divers 34: 15 divers	2 dives/\$55 departs 8:30-9:30 am	1 or 2 dives/\$35-\$55 departs 1-2 pm	\$25
Tortuga Divers Ltd. (809) 947-7449 fax: (809) 947-7669	Cinderella's Castle Barrel Sponge Wall East End	personalized services guided dives special dive sites	(2) 34: 14 divers	2 dives/\$50 departs 9:30 am	1 or 2 dives/\$50 departs 2 pm	\$25
Treasure Island Divers (809) 949-4456 fax: (809) 949-7125	Rhapsody Reef Tarpon Alley Tunnel of Love	handicapped divers program computer diving video services	(3) 45: 25 divers	2 dives/\$55 departs 8 am	1 dive/\$40 departs 1:30 pm	\$30
Brac Aquatics Ltd. (809) 948-7429 fax: (809) 948-7527	Cayman Brac Little Cayman	personalized services special dive sites specialty courses	(2) 53: 20 divers 46: 20 divers 34: 12 divers	2 dives/\$55 departs 8:45 am	1 dive/\$15-\$35 departs 3 pm	\$15
Peter Hughes Dive Tiara (809) 948-7553 fax: (809) 948-7316	Cayman Brac—West End Little Cayman—North End	marine ID camera/video rentals	(5) 40: 20 divers 36: 15 divers	2 dives/\$50 departs 9 am	1 dive/\$40 departs 2 pm	\$10-\$20
Little Cayman Beach Resort (809) 948-4533 fax: same	Bloody Bay Jackson Bay South Coast	personalized services small groups specialty courses	46: 20 divers 34: 8 divers 30: 6 divers	2 dives/price varies departs 9 am	1 dive/\$30 departs 2:30 pm	\$15
Pirates Point Resort (809) 948-4610 fax: (809) 948-4210	Bloody Bay Jackson Point Soto Trader	night diving specialty courses referrals	34: 16 divers 18: 6 divers	2 dives/package price departs 10 am		\$20
Sam McCoy's Dive Lodge (809) 948-4526 fax: same	Bloody Bay Jackson Bay South Wall	personalized services	33: 10 divers 32: 10 divers 28: 8 divers	2 dives/\$45 departs 9:30 am	1 or 2 dives/\$30-\$45 departs 2 pm	\$20
Southern Cross Club (809) 948-3255 fax: (317) 636-9503	Bloody Bay Jackson Point Three Fathom Wall	small groups specialty courses personalized services	34: 14 divers	2 dives/\$60 departs 9 am		yes
Cayman Aggressor III (504) 385-2628, 1-800-348-2628 fax: (504) 384-0817	Grand Cayman Cayman Brac Little Cayman	photo/video center specialty courses	110: 18 divers	diving all day	6 days/\$1,395	yes
Little Cayman Diver II (809) 948-7429 fax: (809) 948-7527	Little Cayman Bloody Bay Jackson reef and wall	personalized services	90: 11 divers	diving all day	8 days/\$1,495	yes

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find some new dive sites to put on your agenda, however.

The walls that surround Grand Cayman are the stuff of undersea legend. The North, West and South sides of the island are being dived as fervidly as ever, with action really picking up on the less-traveled East End where such sites as Cinderella's Castle and Grouper Grotto are making mouths water with pristine diving whenever weather and currents permit. Stingray City has become one of the most photographed dives in the world, and the rays don't seem in any hurry to move on since they're being fed and caressed by visitors from around the world.

The big news on Little Cayman is the opening of the Little Cayman Beach Club in Blossom Village; its 32 units more than doubles the number of rooms available on the island, joining Pirate's Point Resort, Sam McCoy's Diving Lodge and the Southern Cross Club in housing visitors to this small strip of Caribbean paradise.

Access to Little Cayman has been problematic over the years, but that's improving. Air service is currently being provided by a charter company, Island Air, in addition to daily flights on Cayman Airways.

Under water, the hot gossip is the manta ray that has accompanied several lucky divers on night dives in Bloody Bay. Given the sheer verticality of the wall, its shallow lip (30 feet) and profuse marine growth, a manta ray is pure serendipity. In addition, new mooring buoys have been placed and several single-point moorings have been enlarged to help keep the reefs whole and healthy.

Cayman Brac is still the Kingdom of Quiet. The calm is in sharp contrast to the buzz of activity on Grand Cayman. The Brac doesn't have nightclubs, multiple dive operators or even a large variety of restaurants; which may be why the two dive resorts—the Brac Reef Resort and the Divi Tiara Beach—are often booked far in advance.

The Bluff at the island's eastern end is vastly different from the low-lying terrain of its sister islands; down below, it's sort of like a mini-Grand Cayman, with fascinating walls all around and even its own Tarpon Alley near the southwest corner of the island. Little Cayman is accessible by boat, about 10 miles away, and many divers staying on the Brac get a taste of Little Cayman during their stay, heading over to Jackson Point and the Bloody Bay Wall for a couple of dives.

In May, the Cayman Islands hosted a successful week-long Caribbean-wide ecotourism conference; the department of the environment has several projects in varying degrees of development, including the establishment of more replenishment zones for conch and lobster.

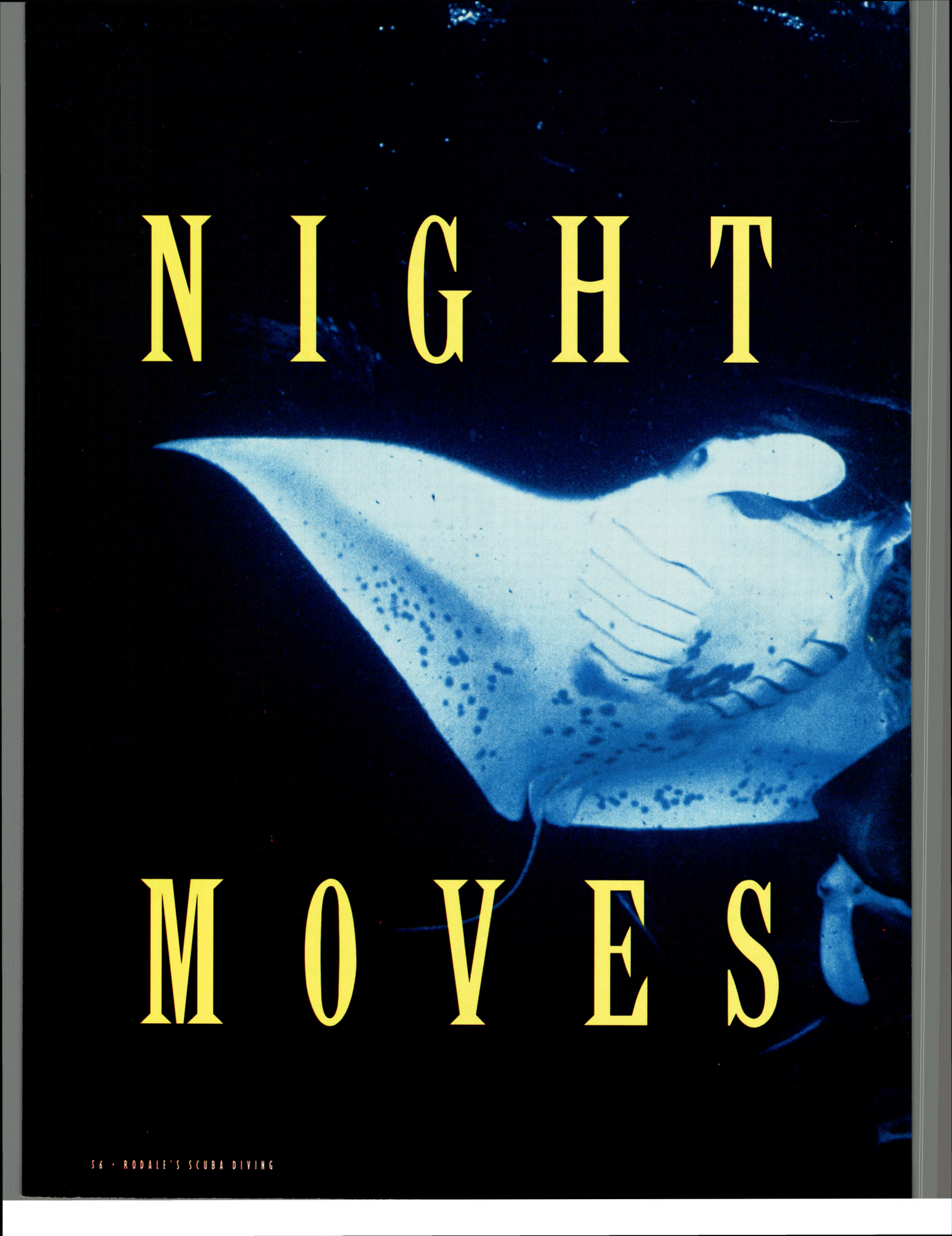
In the meantime, more air service is being provided—United has a new daily flight originating from Orlando, Fla., and American Airlines has got one flying from Raleigh/Durham, N.C., in addition to the flights from Miami on both of those carriers as well as Air Jamaica, Cayman Airways, Northwest and USAir. As usual, more flights signifies more tourist interest, and lots of those tourists spend lots of their time under water. And who can blame them? 🐠

Stingray City has



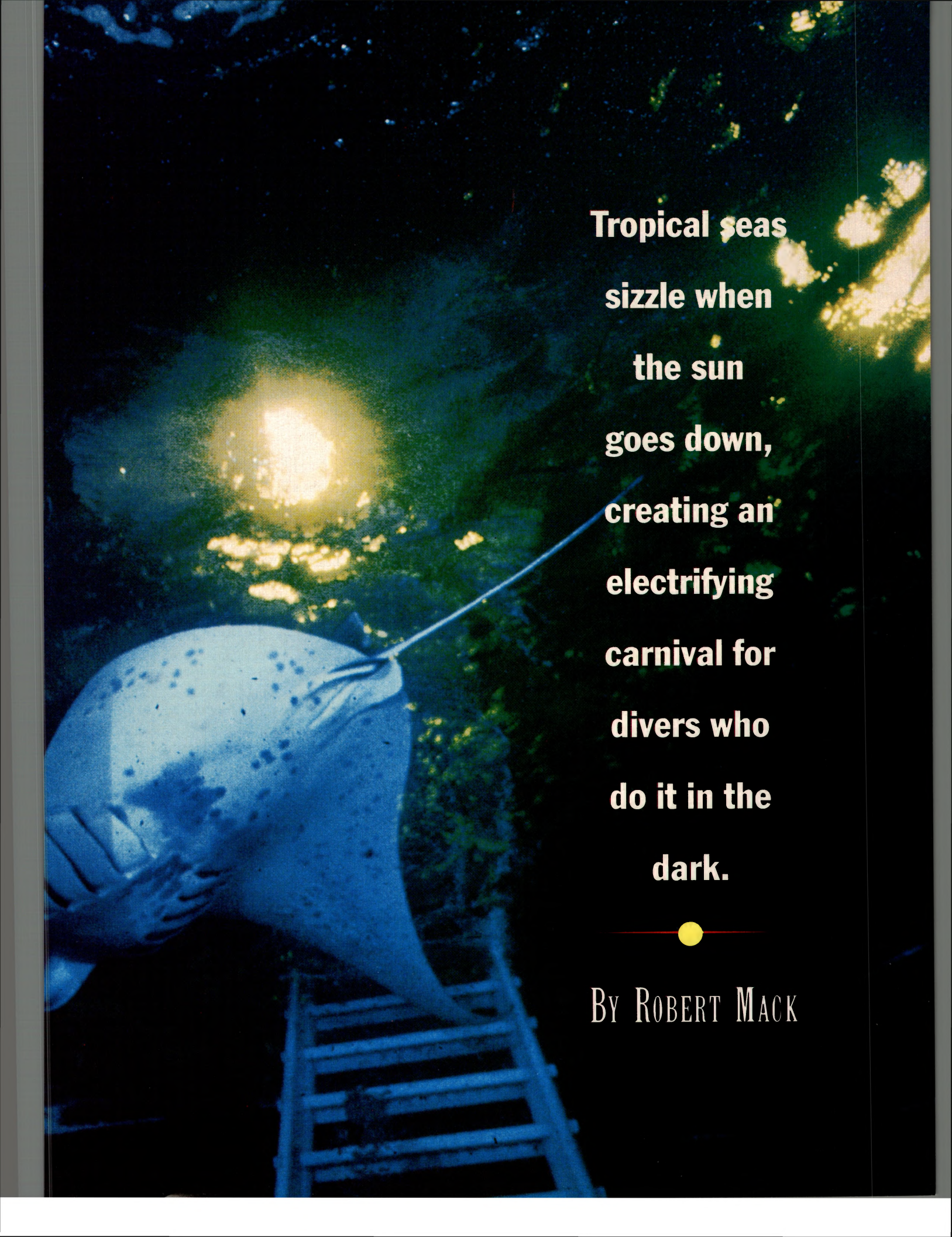
become
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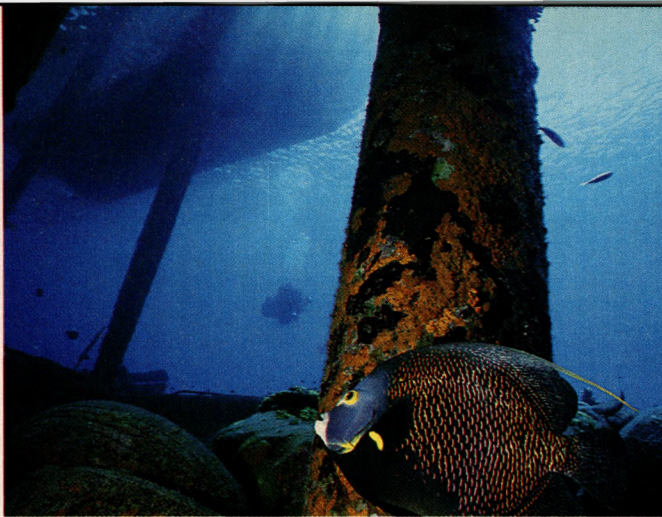
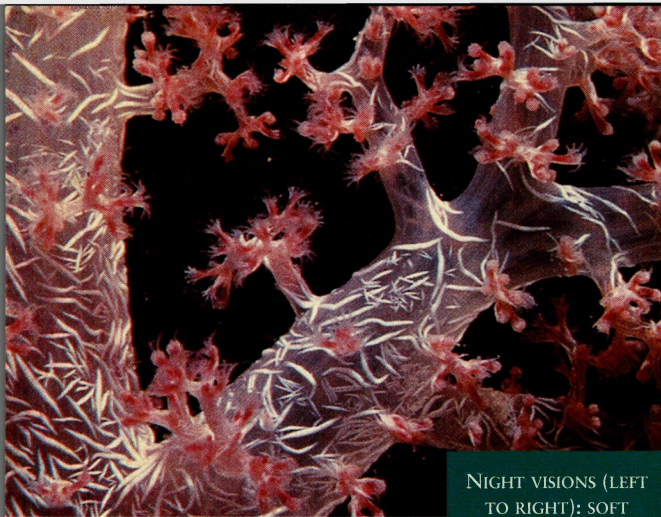
NIGHT

MOVES

A dramatic underwater scene at night. A diver's hand is visible on the left, reaching out towards a large, white, spotted manta ray. A bright, circular light source, possibly a flashlight or a small fire, illuminates the scene from the upper left, creating a strong glow and casting long shadows. The water is dark and textured with bubbles and light reflections. A wooden ladder is visible in the lower foreground, leading down into the water.

**Tropical seas
sizzle when
the sun
goes down,
creating an
electrifying
carnival for
divers who
do it in the
dark.**

BY ROBERT MACK



NIGHT VISIONS (LEFT TO RIGHT): SOFT CORALS COME OUT TO FEED; AN ANGELFISH CRUISES BONAIRE'S TOWN PIER; THE LIGHT-SHY ORANGE BALL CORALLIMORPH; AFTER DARK AT THE FREDERIKSTED PIER; THE "THRONE" IN JAMAICA'S THRONE ROOM.

FOR DIE-HARD DIVERS, GREAT nightlife doesn't mean a case of Red Stripe and an earful of righteous reggae. While these things have an undeniable charm, the real thrills are still below the surface even after the sun sets.

The ocean's surface is a liquid mirror, moonlight glinting off the gentle swells. Slipping in, you hardly recognize the tropical reef you explored just this morning. Tube worms bloom, corals unfurl their tentacles to feed and lobsters prowl openly while octopuses flit brazenly from spot to spot.

Diving at night can seem intimidating at first. You have to dive a little differently (see *Hurry Sundown*, page 85) and remain alert, which can be hard after a full day of diving. But the rewards are many. The reef that appeared vast and overwhelming under the sun becomes an intimate place when captured in the beam of your dive light. For those with a spirit of adventure, a modicum of good sense and the right equipment, night diving is at once thrilling and downright ethereal.

These 10 sites—some famous, others nearly unknown—are a sampler to get you started down deep, where the real action is after dark.

● **FREDERIKSTED PIER, ST. CROIX**
My first night dive was at this site, but I'm not just being sentimental when I proclaim it one of the world's best night dives—try finding someone who's been there who disagrees. The combination of maximum bottom time in 30 feet of water and prolific marine life makes it an after-dark delight.

Clusters of orange cup corals on

the pier's pilings extend their polyps to feed, and yellow, brown and black sponge brittle stars are spread about like throw pillows. Big, beautiful pink-tipped anemones are abundant but will retract if disturbed by a dive light—use the outer edge of the beam to illuminate them. Puffers, parrotfish and trumpetfish are down for the count and can be approached, and the sea-horses are back in big numbers after a few years of relative scarcity.

The Frederiksted Pier makes for a great dive during the day, with all the sponges, corals, worms and schools of snapper, grunt and sergeant majors, but an hour down here at night is fascinating and spectacular.

● **THE LIBRARY, GRAND TURK**
The Library is definitely one for the books. Beginning in just 25 feet of water, the wall is undercut and falls to a ledge another 80 feet down making this a great dive for anyone from neophyte to old salt. A flat, rocky reef scattered with coral-encrusted ballast stones leads to the sheer wall. During the day schools of snapper and gangs of grunts fill the water, but once they retire the Library becomes a veritable nightclub of color and activity.

Marine invertebrates abound—you'll see variegated Christmas tree and feather duster worms, flaming orange cup corals and more rare orange ball corallimorphs than you can count. Lobsters, crabs, eels and shrimp are all out and about; arrow crabs with eyes the color of Elizabeth Taylor's are highlights for macro freaks. The site could be called "Octopus's Garden" in honor

of all the cephalopods you'll encounter.

Named for its location across from the old Grand Turk Library just off the main street of Cockburn Town, divers lucky enough to experience the Library after sunset will find it both novel and poetic.

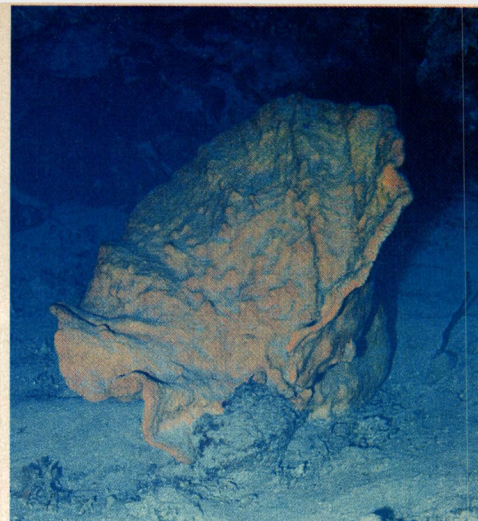
● THE THRONE ROOM, JAMAICA

As the sun slips into the sea and the reggae starts shaking topside, the silent world blooms in darkness. Less than a mile off Negril's famous Seven Mile Beach lies the Throne Room.

The highlight of this dive is a cut in the reef about six feet wide and 30 feet long; carefully dropping down you find yourself in a majestic cave which looks out through a frame of corals and sponges to a sandy plain. A gigantic orange elephant ear sponge to the right of the opening gives the site its name. Bright red rope sponges dangle from the ceiling like flexible stalactites. A six-inch red seahorse guards the entrance of the crevice, and green turtles, sharptail eels and spotted morays thrive. Around the outside of the Throne Room the coral forms many pockets where lobsters sit as if on verandas, watching the world go by; atop the corals and sponges, looking like a field of satellite dishes, basket starfish in three different colors send and receive underwater messages.

● THE TOWN PIER, BONAIRE

Probably the most famous dive in Bonaire is the Town Pier, located just off the capital city of Kralendijk. During the day the pier virtually crawls with schools of French grunts and angelfish, squirrelfish, trumpetfish and rock beauties, and if you get all the way to the sandy bottom about 40 feet



down you'll encounter both yellowfin morays and yellow goatfish. The pilings are almost completely encrusted with butterprint brain and orange cup coral and purple and green tube sponges. Christmas tree worms and arrow crabs dot the landscape.

When the fish go to sleep the orange cup corals extend their polyps to feed and show off for photographers. You may have to surface and clear your mask to believe your eyes. You'll also see plenty of morays swimming about freely, the occasional lobster or octopus and bunches of sponge crabs. Guaranteed—you *will* use all your film.

● LA CEIBA PLANE WRECK, COZUMEL

A small white buoy marks the location of this super night dive, about 65 yards straight out from the end of the dive shop pier at the La Ceiba Hotel. Originally sunk as a prop for a disaster movie directed by Mexican filmmaker Ramon Bravo, the 40-passenger twin engine DC-3 has been tossed about over the years and now rests on a flat sandy bottom 35 feet down.

A wide variety of anemones and arrow crabs cling to the wreck. Purple gorgonians are scattered among the coral heads. Christmas tree worms protrude from the corals and you should also spot hermit crabs, mantis shrimp, blennies and a stableful of seahorses. The schools of grunts that hide in the wreck during the day forage for food at night, and you're also sure to see spiny and slipper lobsters, octopuses and eels.

Unlike many of the other dive sites in Cozumel there's rarely a current here because the plane sits in a protected

area between the shoreline and the International Pier. The shallow depth guarantees nearly limitless bottom time.

● SHAW'S COVE CANYON, LAGUNA BEACH, CALIFORNIA

By day Shaw's Cove is a popular beach diving site for dive classes and individuals; by night, eagle rays and halibut swarm and the place to check out is a little-known gem hidden inside the reef called Shaw's Cove Canyon.

The canyon is cut into the reef about 50 yards beyond the breakers. To find it, swim just beyond the surf line and descend to the 20-foot bottom. Hug the bottom of the reef and swim seaward. The bottom gradually slopes to about 30 feet and the reef veers to the right. Tucked into the bottom of the reef you come upon an underwater arch; pass through and you'll be in the canyon.

Here you'll find a series of underwater rooms, passageways and crevices that come alive after sundown. Lobsters trot along the canyon floor like they own the place, mating octopuses put on their most passionate colors, and you should also spot white aggregating anemones, rose and clown nudibranchs, small reef fish and eels aplenty.

● MANTA RAY MADNESS, KONA SURF HOTEL, HAWAII

At about 9 p.m. the boats' stern spotlights and the lights along the concrete seawall of the Kona Surf Hotel blink on, attracting the little critters manta rays call dinner. Before long a lone manta appears, circling the perimeter of the light beams; soon there's another,

er, then another, until eventually a good dozen animals work their way in closer, mouths open, scooping up plankton. At the peak of the feeding they're somersaulting and spinning, bumping into divers and each other, clearly enjoying the feast.

At first, the mantas are wary of divers, so it's best to ease into the water and keep splashing and bubbles to a minimum. As they approach the boat and get caught up in the excitement, they'll begin to ignore you; in fact, the mantas have been seen under boats and bumping swim steps, swimming between divers' legs, and knocking masks off with sweeps of their wings. The mantas stay tightly within the limits of the lights, so although you're diving an open stretch of coastline it feels like you're in a tank with a horde of enormous underwater acrobats.

● QAMEA FREEWAY, FIJI

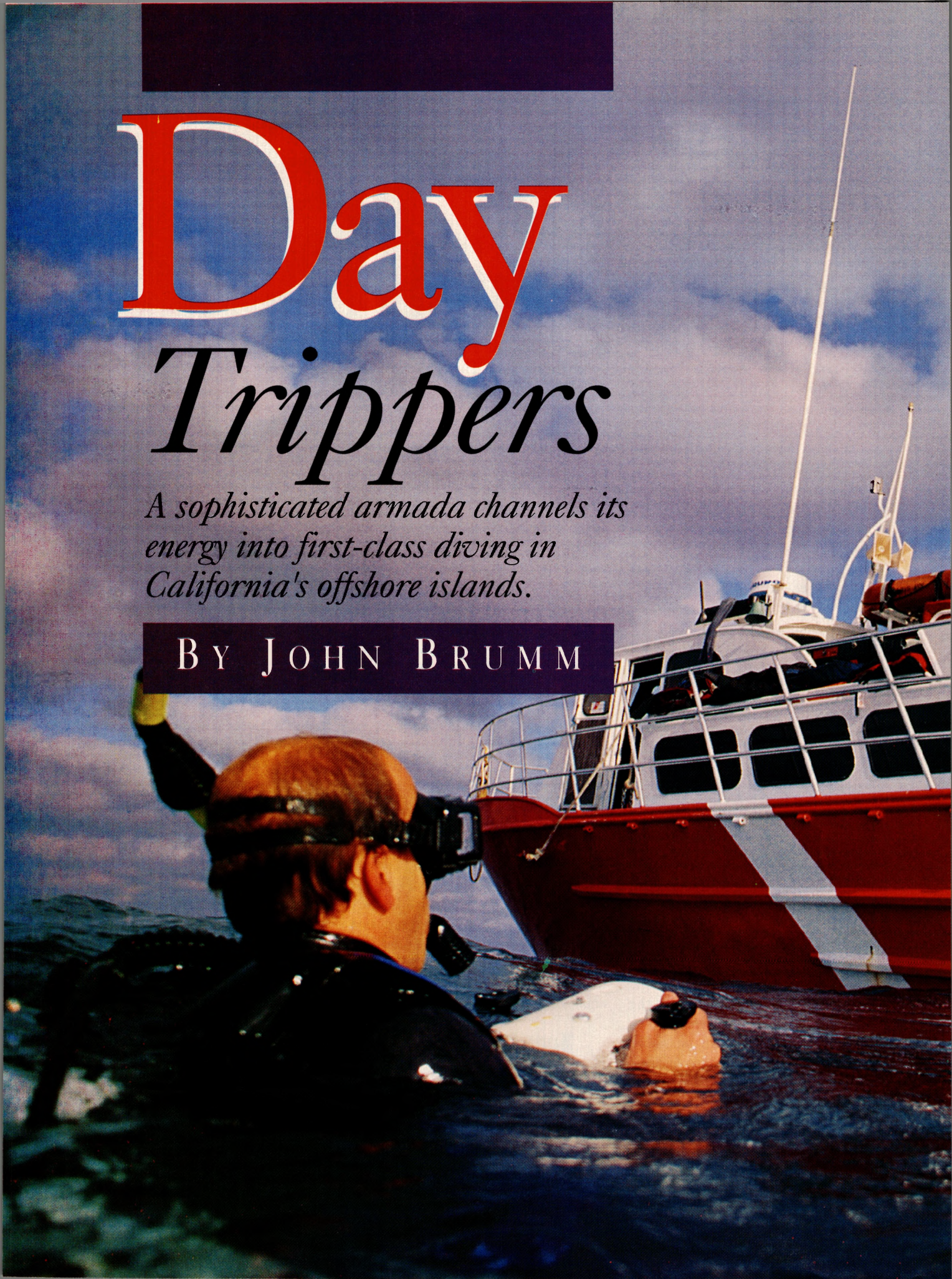
One of the many astounding night dives in the Fiji Islands is a moderate-current drift dive on the north end of the island of Qamea, appropriately named the Qamea Freeway. You drop into 50 feet of water and begin cruising; a kaleidoscope of color dazzles the eye almost immediately as you glide atop endless colonies of feeding polyps, feather worms and hundreds of soft corals in pink, purple and lavender festooned with basket and brittle stars.

Large turtles slumber under tabletop corals and the sharks are more alert than during daylight hours; you might see a nine-foot bronze whaler just off to your left checking you out, or perhaps a four-foot whitetip moving among alternating maroon and red sea fans. Other likely subjects are free-swimming four-foot (Continued on page 92)

Day *Trippers*

A sophisticated armada channels its energy into first-class diving in California's offshore islands.

BY JOHN BRUMM





Down to the docks they come, dive bags slung from shoulders, tanks in hand, climbing aboard charter vessels every weekend of every month of every year. They're young and old, men and women, from all walks of life; hunters, photographers and underwater cruisers, 30-year diving veterans and wide-eyed newcomers. All are looking forward to great diving and a chance to meet some new diving friends. The common bonds are that each one carries "the Card," is driven by a love of diving and is dedicated to having one hell of a good time.

These docks are their launching pads for adventure; they're also the berths for California's big-boat dive fleet. These fully equipped, self-contained dive vessels carry from 15 to 50 divers in styles ranging from relative comfort to a sort of rough luxury. Almost all are equipped with comfortable bunks, hot water showers, galleys and sophisticated air-fill systems. Some even have semi-private staterooms. A few offer amenities like wetsuit hanging

IRENE HASHIMOTO

THE CHANNEL ISLANDS

SAN CLEMENTE

- The southernmost of California's Channel Islands, owned by the U.S. Navy.
- Popular dive spots: southeast end—Pyramid Head, Little Flower, Window Pane; northwest end—West Cove, Seven-Fathom Spot, Northwest Harbor wrecks.
- Warning: Do not touch anything that has military markings or that looks like it might be military material.
- A five- to six-hour trip from Long Beach or San Pedro. Boats depart the night before the scheduled diving day.

CATALINA

- The only California island with a town on it and with regular ferry and plane service from the mainland.
- Popular dive spots: west end—Ship Rock, Bird Rock, Isthmus Reef; east end—Avalon's underwater park, Pinnacle Rock, Jewfish Point.
- A two-hour boat ride from San Pedro and Long Beach harbors. Boats leave the dock between 6:00 and 7:00 am.

SANTA BARBARA

- Measures only one mile long by one-and-a-half miles wide. Best known for its sea lion rookery.
- Popular dive spots: north end—Arch Reef, Shag Rock, Hidden Reef, the sea lion rookery; south end—Butil Island, Southeast Reef.
- A four- to five-hour trip from San Pedro/Long Beach. Boats leave the night before the scheduled diving day.

SAN NICOLAS

- Most seaward of the Channel Islands, owned by the Navy and considered the best island for game hunters.
- Popular dive spots: west end—The Boiler, Seven-Fathom Reef, Begg Rock; east end—anywhere inside designated "Charlie" area.
- Warning: Beware of anything bearing military markings.
- Six to seven hours from San Pedro. Boats generally leave the docks by midnight the night before the dive.

ANACAPA

- Made up of three small islets connected by narrow, shallow sandbars. Its 40-foot arch has become the trademark of the Channel Islands National Park.
- Popular dive spots: East Island—Arch Rock, Cathedral Cove; Middle Island—wreck of the *Winfield Scott*; West Island—Frenchy's Cove, Cat Rock.
- One-and-a-half to two hours from Ventura/Santa Barbara. Boats leave between 7:00 and 8:00 am.

SANTA ROSA

- Known for its strong currents and unpredictable weather. Diving pressure is relatively light.
- Popular dive spots: north side—Talcott Shoals, Carrington Point, Becher's Bay; south side—wreck of the *Chickasaw*, Johnson's Lee, East End Pinnacles.
- A trip typically takes three to four hours. Boats leave the dock in the early morning hours prior to the diving day.

SAN MIGUEL

- Northwesternmost of the Channel Islands and the most rugged, with the most unpredictable weather patterns.
- Popular dive spots: west side—Whistle Buoy; east side—Cuyler Harbor; south side—Wyckoff Ledge; north side—Wilson's Rock.
- Trips take five or six hours. Boats generally leave the docks after midnight.

racks, clothes dryers and video systems for the instant replay of underwater videos. Most have color TVs and VCRs for watching feature films and stereo systems for listening to tunes. And each is staffed by an experienced dive crew whose number one job is to ensure you're having a good time.

Their job is made considerably easier by the fact that the boats cruise the Channel Islands, arguably some of the best diving grounds on this—or any other—continent.

While charter dive boats can be found in nearly every major harbor on the California coast, the majority of the big boats that cruise the Channel Islands are concentrated in four harbors: Long Beach, San Pedro, Ventura and Santa Barbara. Most of these boats can run to

any of the islands from any of these harbors. Generally, the boats out of Long Beach and San Pedro frequent the southern end of the chain—San Clemente, Catalina, Santa Barbara and San Nicolas. The Ventura and Santa Barbara boats most commonly visit the northern islands: Anacapa, Santa Cruz, Santa Rosa and San Miguel.

A Boat To Call Your Own

When booking a Channel Islands charter you can choose from a single-day trip, a weekend or a full-blown outer-island dive adventure stretching to four or five days.

For the most part, boats operating

out of the same harbor run the same islands, and the skippers and crews pretty much know all the good spots. Since the boats can't really compete on dive sites, they concentrate on outdoing one another with accommodations, on-board diving systems, flexible schedules, quality of service and how much fun a customer can get for his or her diving buck.

Consequently, you'll find boats with sophisticated equipment, boats willing to run both weekend and week-day trips, galleys that cook up first-rate meals instead of just greasy burgers, movies, music and snacks for the ocean crossings, and lots of smiles from everyone on board.

You'll also find a few boats that don't work quite so hard at pleasing

ON A CLEAR DAY...

Fifty miles off the coast of California, where the air resonates with the songs of sea birds, dawn washes over the tiny island of Santa Barbara. Desolate and lonely, it rises out of the Pacific like the head of a rock serpent surveying its ocean solitude. Flocks of birds forage in the hilltop scrub and soar idly across bleached cliff faces. Lazy swells roll in, breaking along the steep shoreline. A colony of sea lions rustles in a heaving, dirt-brown wave.

Lying at anchor just offshore with its red-and-white diver down flag snapping in the morning breeze, a Southern California charter boat awakens. It's a sleek vessel, 80 feet long, with a huge cabin, towering superstructure and wide-open after-deck. Galley lights glow through the forward windows and the piquant aromas of fresh coffee and bacon and eggs mingle with the morning sea air.

As the sun pulls itself free of the liquid horizon, a couple wearing matching jackets lean against the aft rail, sip coffee and watch two buddy teams gear up for the first dive of the day. The water is still dark beneath the keel, but with dive lights ready these four are anxious to catch the changing of the guard as the nocturnal creatures retire and the day shift comes on line down below.

Not everyone is so impatient. It's the third day of a multiday trip, and for most the pace has slackened. In the main cabin, three hungry teenagers can think only of breakfast. At a corner table, two divers assembling cameras pause to listen to the barks erupting from restless sea lion pups on the beach.

Everyone else is still downstairs, burrowed in their bunks, luxuriating in the boat's gentle rocking, preferring to let the day mature a bit before rejoining the adventure. This morning offers an opportunity scarce in the workaday world: a moment on a cool morning when you don't want to get up—and you don't have to.

Such are the beginnings of another great day of charter boat diving. Here in the Channel Islands, the air is fresher, the water cleaner, the reefs more colorful, the kelp thicker and the sea life more abundant than anywhere else off California.



TOM CAMPBELL



DARREN DOUGLASS



BRUCE WATKINS



RICK BAKER



IRENE HASHIMOTO

CLOCKWISE FROM TOP: THE VISION'S DIVE DECK; SHARK DIVE OFF THE MAGICIAN; A BOAT CALLED TRUTH; THE CHANNEL ISLANDS SPECTRE; GEARED UP ON THE ATLANTIS.

the customer; they tend to be the boats that aren't so busy.

When choosing a boat, don't let a pretty face turn your head. Bigger doesn't automatically mean better, and newer doesn't automatically mean nicer. Big boats with sleek lines have been known to lack small but important amenities like curtains on bunks.

If you're new to boat diving, a good way to get a feel for the boats is simply to ask diving friends or dive stores for recommendations. The boat diving community is small, so good or bad service, efficient or inefficient diving systems and poor food don't stay secrets for long.

Having said that, keep in mind that divers are notoriously opinionated and have been known to develop extreme prejudices based on irrational criteria. It's not unusual to get three conflicting opinions from three divers. So ask questions and gather opinions, but also realize the only way you can find out if a boat is right for you is to check it out for yourself. All the boats

are basically good, but they offer different styles of service. What do you want?

The Price Is Right—Right?

Don't assume that for two boats offering the same trip the less expensive boat is the best deal.

For example, you may find two boats leaving San Pedro for San Clemente. One charges \$70, the other \$85. But when you look closer, you discover the \$70 boat charges for air fills and meals, while the \$85 boat includes air fills and meals. The higher-priced charter will actually end up costing you less.

Compared to many other destinations, California boat diving is a bargain. It'll set you back \$50 to \$60 for a Catalina-type day trip or \$70 to \$90 for an outer-island day trip. For that you get at least three dives, between-dive snacks, maybe a barbecue, maybe a movie, and,

if the trip is all-inclusive, you also get air fills and meals. Combine this with the satisfaction of spending a day enjoying nature in the company of fun-loving, like-minded sportsters and it's clear a Channel Islands charter is more than a deal—it's practically a steal. ☉

West Coast Editor John Brumm's adventure diving the Kermadec Islands begins on page 42 of this issue.

Anchors Aweigh

If you want to charter a trip aboard one of these day boats, pick a port and call for particulars about the boat, areas visited, services and prices. The numbers that follow the entries indicate boat length and maximum number of divers allowed (e.g. 55'/40 indicates a 55-foot boat that carries a maximum of 40 divers).

LONG BEACH

- Mr. C, (310) 495-1815; 55'/40.
- Sundiver, (310) 493-0951; 53'/28.

SAN PEDRO

- Atlantis, (310) 592-1154; 65'/40.
- Bold Contender, (714) 272-1427; 65'/38.
- Charisma and Encore, (310) 832-8304; (2) 78'/35.
- Golden Doubloon, (714) 963-4378; 65'/34.
- Magician, (310) 548-6129; 65'/30.
- Maverick, (310) 547-3824; 58'/30.
- Westerly, (310) 833-6048; 55'/30.
- Wild Wave, (310) 534-0034; 65'/26.

VENTURA

- Chieftain, (805) 652-2166; 50'/20.
- Liberty, (805) 642-6655; 85'/40.
- Peace, (805) 658-8286; 65'/32.
- Spectre, (805) 483-6612; 85'/40.

SANTA BARBARA

- Conception, Truth and Vision, (805) 962-1127; 80'/40, 75'/40, 65'/40.

How To Choose A CHARTER

Before you plop down your money on a boat dive, make sure you know what type of trip you're signing up for. If you're a photography buff you might not want to book a trip on a boat where there'll be a lot of hunting. If you're a beginning diver you don't want to book one that's heading to advanced diving sites. And conversely, experienced divers who book a trip with a boatload of students out to take their certification dives might not have much fun either.

In short, don't be shy. Ask as many questions as you need to make sure the dive charter in question is one you want to take. If answers aren't forthcoming, hang up and call another charter; there are plenty of boats out there willing to take the time to answer your questions and earn your business.

Some questions to ask:

- ☛ Where's the boat berthed?
- ☛ Where's the boat going?
- ☛ Is this a hunting trip? A photography trip? A class trip?
- ☛ In general, what's the skill level required for the dive sites?
- ☛ How many dives can I expect to make?
- ☛ How much does the charter cost, and what does this price include?
- ☛ Where can I park my car while I'm on board?
- ☛ What time does the boat leave the dock?
- ☛ What time do I have to be on board?
- ☛ Can I board the boat the night before the dive?
- ☛ Will there be a divemaster on board?
- ☛ Are ice chests allowed?
- ☛ Is there oxygen on board? Enough to get two divers back from the trip's farthest point?
- ☛ Has the crew been trained in oxygen delivery?
- ☛ What should I bring in the way of additional clothing, sleeping gear, etc.?
- ☛ What kind of additional charges might I expect to encounter during the course of the charter (i.e., soft drink charges, air-fill charges, crew tips, etc.)?



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“**F**inding water’s a lot easier with a Suzuki than a divining rod,” says Todd Giddings, owner of an environmental engineering company that specializes in locating underground water in some of Pennsylvania’s most remote country. There’s just nothing better for getting around mud-slick work sites up in the Appalachians than his 2-door Sidekick.



“The standard 15" tires, tough engine and light weight mean I can get in and out of places where bigger 4X4’s have gotten stuck. In fact I’ve towed a couple of those guys out,” he laughs. Todd also regularly tows almost 1000 lbs. of gear in a custom-built trailer. “The shorter wheelbase makes the Sidekick amazingly maneuverable—even in reverse, and you know how tricky that is with a trailer.” Better yet, for a guy who’s 6’6", is the Sidekick’s interior headroom. “I meet people in gas stations who don’t believe I just got out of it. And I can do it without taking my hardhat off—easy.” But all work and no play would make Todd a dull boy, so on weekends, he loves nothing better than towing his sailboat to the nearest lake: “My Suzuki can practically find its own way to the water.”



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PORT ANGELES, WASH.

Continually flushed by tides, the Strait of Juan de Fuca offers cool, clear diving.

BY CHARLES SEABORN

MAP BY KAREN MINOT

If you ask a Seattleite where the best diving in the Pacific Northwest is, he or she will most likely point north, in the direction of the San Juan Islands, British Columbia's renowned Campbell River, Barclay Sound and Port Hardy—the invertebrate mecca of the world. But if you look west there's another cold-water hot spot that offers similar diving: the Strait of Juan de Fuca and the Olympic Peninsula. Cool, clear water and a variety of sites available from boat or shore attract divers to enjoy rich invertebrate life.

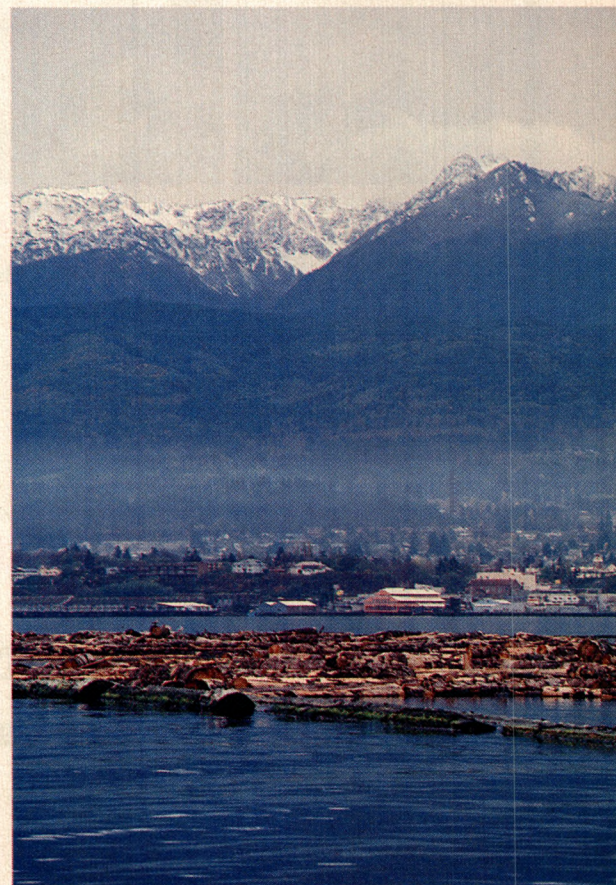
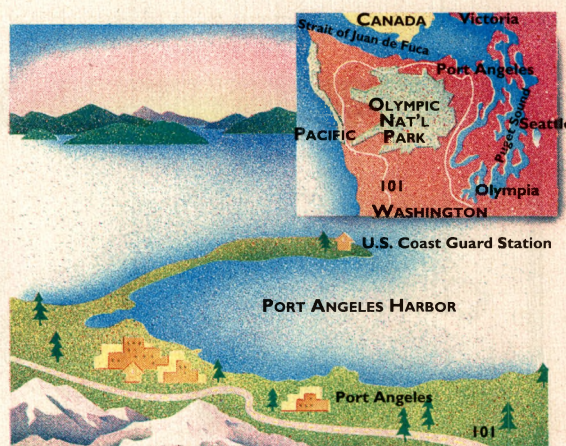
Port Angeles, the focal point of diving along the strait, is located on the northern edge of the Olympic Peninsula. The town is a hub for the state's hallmark industries, timber and fishing.

The strait is the primary channel through which clean, cold, Pacific Ocean water enters northwestern Washington. The water stays free of sediments because very little fresh water runs off into the strait, a result of the rain shadow cast by the Olympic Mountains. At its eastern end the strait meets Admiralty Inlet, the primary gate for ocean water entering southern Puget Sound. A shallow sill at the mouth of the inlet restricts the flow of water.

As the tides turn, the twice-daily exchange of ocean water flushes the strait, bringing in clean plankton-laden water and taking out sediments and pollutants. The result is abundant and diverse marine life. The predominantly rocky bottom also provides a good foothold for filter-feeders such as barnacles, sea cucumbers, anemones and tube worms.

Salt Creek State Park, a few miles west of Port Angeles, is a good place to start your peninsula diving. The park is located at Tongue Point and offers overnight camping close to Port Angeles. Concrete staircases provide access to four shore dives within the park. Weather

CHARLES SEABORN



SERIOUS DIVING AND FUNNY FACES, LIKE THIS RED IRISH LORD (ABOVE LEFT) AND THIS ROCK PRICKLE BACK (LEFT) AWAIT DIVERS OFF PICTURE-PERFECT PORT ANGELES (ABOVE).

and water conditions will determine which sites are diveable on a given day. In places, the rocky shoreline at the bottom of these stairs is coated with slippery diatoms, so watch you step.

Under water, you'll find the seafloor is covered with marine life. In the shallows, algae dominates the seascape. Some truly look like plants, their broad, flat blades firmly attached to the rocky bottom by a woody stalk. Others look more like fungus, growing

low and flat on the rocks. These are the coralline algae, and their bright red and pink colors brighten the scene as you swim into deeper water. The rest of the bottom is covered with invertebrates. Giant red anemones are easy to spot, as are aggregations of giant barnacles, two to three inches high (giant being a relative term in the world of the barnacle). If you look closely you'll see snails, small crabs, shrimp, tube worms and other nesting inverts attached to or

Dive In

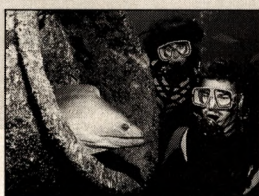
From Seattle, the most direct way to get to Port Angeles is to take the 30-minute ferry ride from downtown to Bainbridge Island. From there it's about an hour's drive up Highway 104, which connects with Highway 101 leading to Port Angeles. From anywhere in the southern Puget Sound area the most direct route is across the Narrows Bridge, up Highway 16 through Bremerton and onto the peninsula via Highway 3, to Highway 104, connecting with Highway 101. It's about a two-hour drive from Tacoma.

Water temperatures are cool year-round, requiring a dry suit or a complete quarter-inch wetsuit.

Two dive operations serve the Port Angeles area: OLYMPIC DIVERS, (206) 452-5264; PORT ANGELES DIVE AND SPORTS, (206) 452-3483.

For tourist information, contact the PORT ANGELES CHAMBER OF COMMERCE, (206) 452-2363, or the NORTH OLYMPIC PENINSULA VISITOR AND CONVENTION BUREAU, (206) 452-8552. For information about Olympic National Park call the PIONEER MEMORIAL MUSEUM VISITOR CENTER, (206) 452-0330. For ferry schedules, call the WASHINGTON DEPARTMENT OF TRANSPORTATION, (206) 464-6400.

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exploring the nooks and crannies.

Roughly 50 fin kicks from shore, a bull kelp bed begins in about 20 feet of water forming a punctuated ribbon of giant algae that runs parallel to the shore for miles. The bottom is a mix of rock rubble, car-sized boulders and exposed bedrock, an extension of the shoreline. On a recent dive here I never ventured past the kelp bed. In fact, I found myself deflating my BC, inflating my dry suit (for a little added warmth) and settling down to watch the show.

I didn't move more than 100 yards down the shore. When it was time to surface I swam up the rock into shallower water, watching as the marine life changed with depth. It was as if it just kept going up the rock face, breaching the surface and colonizing the very shore I was crawling out on. Taking my fins off in a giant tide pool, I found myself surrounded by the marine life I thought I had left "down there." ☺

Charles Seaborn, a Seattle-based photojournalist and marine biologist, is a principal of Sea Reach, an environmental development firm, and a frequent contributor to Rodale's Scuba Diving.

CIRCLE NO. 82 ON READER SERVICE CARD

LAKE HURON

A fleet of wooden ships awaits rediscovery in the cold, fresh water that preserves them.

BY GARY GENTILE

The majestic days of sail are history. A few tall ships have survived the onslaught of time, but they no longer carry freight; they're exhibition ships, museums or floating restaurants. Those who serve before the mast do so in luxury and with full realization that, in dire straits, they can be lifted off the decks by a Coast Guard helicopter.

Yet a huge fleet of windjammers can still be found along the trade routes. These are the lost ships, their unfinished voyages frozen in suspended animation.

Those who dive on wooden wrecks are usually disappointed. The ragged remains only vaguely resemble the stately ships of our imagination. A brig on the beach is battered to kindling in no time; a clipper sunk farther offshore is reduced to a few worm-eaten ribs protruding from the sand. A barkentine in deep water, although somewhat protected, is beyond reach.

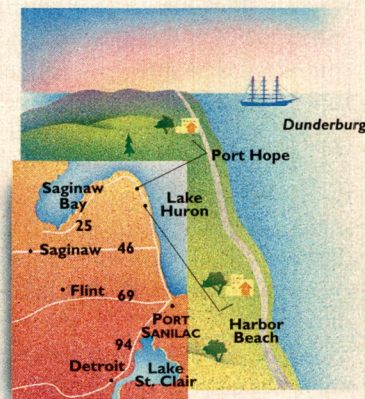
But the bottom of Lake Huron—where the water is fresh, clear and cold—is safe harbor for a flotilla of merchantmen that never reached port. After a pleasant two-hour drive from Detroit or Flint, Mich., divers are finding their imaginations challenged by ships like the *Dunderburg*.

I didn't know what to expect as I loaded my gear on the deck of the *Obsession*. The lake's reflective surface betrayed no trace of wind and, as I discovered when I rolled over the gunwale an hour later, there was no hint of current; the anchor line went straight to the bottom, taut as a fire pole.

I was thankful for my dry suit as I passed through the sharp thermocline. Room-temperature water dropped 30 degrees in a single breath,



WITH LITTLE CURRENT AND NO TEREDO WORMS, WOODEN SHIPS LIKE THE SWEEPSTAKES (ABOVE) SUFFER LITTLE DETERIORATION EVEN AFTER DECADES ON THE LAKE BOTTOM. A DETAIL FROM THE *DUnderBURG* (BELOW).



Dive In

The *Dunderburg* is just one of 30 wrecks resting in Lake Huron. It lies off the shores of Michigan's lower peninsula north of the towns of Harbor Beach and Port Hope on Route 25—looking at a map it's just about where the right side of the Thumb's cuticle begins, about 120 miles north-northeast of Detroit. Summertime is usually prime dive season, although the water's going to be cold whenever you go, hovering around 40F once you descend through the thermocline. Visibility is typically 20 to 30 feet, so bring your dive lights.

Divers with their own boats can launch from either the Harbor Beach city marina or a commercial one; other visitors can make arrangements through Gary Biniecki at the Four Fathoms Dive Shop in Port Sanilac, about 30 miles south, by calling (313) 622-8013.

Huron County, Mich., is a lovely summer resort area; there are several campgrounds, county parks and two state parks nearby where visitors can fish, swim and canoe. A terrific museum and interpretive center at Lighthouse County Park in Port Hope provides a fact sheet on bottomland preserve shipwrecks with LORAN coordinates, and a half-hour orientation video showing preserve shipwrecks can be viewed upon request through Oct. 1 by calling (517) 428-4749.

For more information about tourism and accommodations in the area contact the Greater Port Austin Chamber of Commerce at (517) 738-7600.

bottoming out at a bitter 41F.

Visibility dropped as well, from a comfortable 30 feet to about 20. Some sediment floated above the wreck, but enough natural light filtered down to permit exploration without a light.

The *Dunderburg* lay on an even keel, more like a ship in drydock than a wreck at the bottom of a lake. The planking was unbroken, and the thick railing was covered with deadeyes and belaying pins, as though waiting for a sailor to tighten the shrouds. The main mast still stood straight and tall, but the top had snapped off and the sails were missing.

The deck could have been swept clean the day before. Only a thin layer of silt covered the wood; a swipe of my hand revealed the coarse grain underneath. When I exchanged glances with my dive buddy, her astonished expression mirrored mine.

The *Dunderburg* slid down the ways in 1868, just three years after the end of the Civil War. Construction was completed that spring; the dimensions listed on her certificate of enrollment are 186 feet long by 33 feet wide, with a draft of 18 feet and a carrying capacity of 596 tons. Her three masts were schooner-rigged, and she had a single deck and a square stern, not too different from hundreds of other lake vessels of her time.

She entered the grain trade under the ownership of Trowbridge, Wilcox

& Co., and for more than a year worked the routes between Chicago and Buffalo.

Aug. 13, 1868, found the *Dunderburg* downbound (from a higher elevation to a lower one) with 40,000 bushels of corn and five passengers, including owner Wilcox's wife. Capt. Charles W. Green saw the steamer *Empire State* approaching, upbound from the St. Clair River, when it was still "some ten miles ahead about a point and a half over our starboard bow."

The ships were converging off the southern entrance to Saginaw Bay in an area called Point aux Barques, better known today as the Thumb. Visibility was excellent under a starlit sky, and several other ships could be seen in the distance. When it became apparent the *Empire State* would pass uncomfortably close, Capt. Green signaled furiously for the steamer to yield way.

Sensing the inevitable, Green got the passengers on deck. According to the captain's log, "A fearful crash followed. The propeller struck the schooner between the main and the mizzen masts, on the port side, crushing in her planks and timbers, and creating a hole several feet in depth, and cutting her down below the water's edge."

The shock of the collision snuffed out the *Dunderburg's* kerosene

lanterns, and the ship was plunged into darkness. Water poured into the hull at a frightful rate. With the ship settling quickly, the crew launched the lifeboat and ushered everyone aboard. When a count was taken, Mrs. Wilcox was nowhere to be found. She was the only casualty.

The *Empire State* heaved to. Her forward planks were smashed and she was taking on water in the bow compartment, but a steam pump stemmed the flood. The steamer picked up the *Dunderburg's* survivors, then continued on to Chicago.

Now I saw the breach in the wreck's hull. The decking was torn, the wood splintered. The schooner lay on a hard clay bottom. Several inches of lake sediment was not enough to cover the rigging that had toppled overboard.

We swam back across the deck, over an open hatch, then forward along the gunwale past the fallen crosstrees. We found the woodstock anchors lashed to the rail next to the cathead. Then we followed the jibboom to its point nearly 60 feet away, turned around and dropped under the bowsprit.

There we came face-to-face with the ship's alligator figurehead. With mouth agape and tongue protruding, its back and the top of its head were firmly attached to the underside of the bowsprit. A fine fringe of algae made it look slightly out of focus, except for the bright dot of red paint that gleamed in the center of its eye. The ridged tail extended six feet, blending with intricately carved designs of foliage, leaves and curled branches.

For more than 120 years the *Dunderburg* lay on the bottom, waiting patiently, like an unopened Egyptian tomb, to present itself to a generation that looks upon wooden ships not as beasts of burden but as works of art.

The *Dunderburg* may be the queen of the Great Lakes' ghost fleet. Here in the ice-water canyons, they wait to be rediscovered by weekend visitors up from the cities that no longer need their services. ☺

Gary Gentile is the author of *The Advanced Wreck Diving Guide* and the forthcoming *Survival At Sea*.

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U/W Photo: Cathy Church

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MONTAUK, N.Y.

The waters off this Long Island fishing village offer more than just great seafood.

BY JAMES MCBRIDE

Montauk, located on the extreme eastern tip of Long Island 120 miles east of New York City, takes its name from the Indian word Montaukett, meaning “hilly land” or “island country.” The original inhabitants apparently intentionally understated the geographic descriptions of the area, because Montauk, with its patchwork of coves, bays, lush meadows and thick hardwood forests, offers some of the most beautiful scenery on the eastern seaboard.

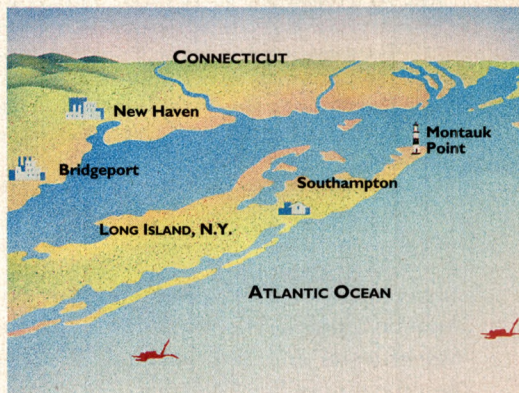
Montauk’s *raison d’être* is fishing. Its proximity to deep-water ocean banks full of feisty sport species including tuna, sea bass, sailfish, shark and marlin attracts anglers from all over the world. Dozens of charter boats are available, and many are equipped with radar, LORAN and fish-finders, making the likelihood of catching something pretty certain.

Unfortunately, diving isn’t a featured activity in Montauk; in fact, there isn’t even a dive shop here. Boat charters are available and some New York City shops can arrange services for visitors (see “Dive In”). Despite this, Montauk does offer a wide range of diving experiences. Montauk is one of the best areas in the Northeast for advanced open-water diving as wrecks dating back as far as the mid-1600s litter the waters surrounding Long Island.

Before tackling the wrecks, however, Fort Pond Bay with its lake-like demeanor and interesting biota is an excellent place to brush up on diving skills. Several motels and condo complexes, including the Port Royal Club and the Born Free Motel, are conveniently located on the bay’s south shore.



YOU CAN VISIT THE MONTAUK LIGHTHOUSE TOPSIDE OR SEE STARS UNDER WATER OFF THE EASTERN TIP OF LONG ISLAND.



RICKEHULTS; MAP BY KAREN MINOT

Both are so close to the water that you can practically dive out of your bedroom. But beware if you're not staying at one of these places or diving with someone who is; the beaches are private and the owners don't take kindly to trespassers.

On the northeast point of Fort Pond Bay, in about 30 feet of water, lies the British warship *Culloden*, which sank during a storm in 1775. All that remains today is an outline of the ship's ballast stones and an occasional cannon ball.

Several miles out from Fort Pond Bay, close to Block Island, lies the coal tender *Black Point*, sunk by the German sub *U-853* during the last naval

was nicknamed "Old Shaky" because of its extreme instability. In 1961 it lived up to its name when it capsized in a hurricane, killing 20 people. Prized by divers for its abundance of marine life, the Texas Tower hosts blackfish, sea bass, sea robins, soft coral, assorted crustaceans and enormous lobsters. Visibility is usually pretty good, allowing divers a mezzanine view of the larger sea creatures that pass by, such as blue and basking sharks and the occasional finback whale. (Also see "Texas Tower 4," June 1993, page 83.)

Other wrecks that can be reached from Montauk include the freighter *Grecian*, which sank off Block Island

If you're looking for critters, think night diving as many of the resident species are nocturnal. I dove the seaplane pier on my first day and saw very little, save for several clumps of mussels and a tiny triggerfish. That same dive at night was radically different. Swarms of pipefish and carpets of crustaceans appeared with every flick of our lights. During the summer, large, edible blue crabs and Maine lobsters populate the shallows. Consult local game authorities regarding size, sex and limit on catches before you take anything, however. The number of lobsters has declined in recent years and nothing upsets the area's many commercial and sport fishermen more than seeing divers taking bagfuls of illegals, clueless to the dramatic impact this has on the area's wildlife.

The climate has conspired to keep Montauk from becoming a dive mecca. Diving is very much tied to the vagaries of season and weather. Surface temperatures hover between 63F and 70F during the summer and several clicks above freezing in the winter. A quarter-inch wetsuit is required in even the best conditions. Near shore, visibility ranges from nonexistent to 10 feet, although divers report visibility up to 50 feet offshore.

In late summer and autumn the Northeast catches gale force winds and, on occasion, a hurricane bounces up from the tropics. Summer is generally calmest, but the August weekend I dove Montauk it rained constantly and I had to abandon a planned dive on the barge off Gurney's Beach due to heavy seas and lightning. Belize it ain't. But no one ever said northern diving was like the tropics. If your experience is limited to warm, clear water, it takes some getting used to. Personally, I loved it. Especially for New York-based divers, Montauk is about proximity, challenge and, of course, the genuine beauty of the surroundings. Like everything else in the domain of the city that never sleeps, at times you may have to work a little harder to enjoy it. ☺

James McBride is a writer and diver based in Manhattan.

Dive In

Montauk is located at the eastern tip of Long Island, about 120 miles from New York City on Highway 27, also known as the Sunrise Highway.

The best diving season is summer, when surface temperatures can reach 70F and the weather is at its calmest. The best visibility, however, is in the spring when nutrient blooms have subsided and visibility on some of the offshore wrecks reaches 50 feet. At a minimum, quarter-inch wetsuits are required year-round and local wreckhounds prefer dry suits for their offshore adventures.

For more information on diving services and accommodations:

MONTAUK CHAMBER OF COMMERCE, (516) 668-2428;

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engagement of World War II in the Atlantic Theater. The wreck sits in 90 feet of water and in recent years has become a popular dive spot. Due to weather conditions, the site isn't always accessible, so on good days the wreck can get a bit crowded as groups converge to take advantage of the conditions. Ironically, several miles to the east of the *Black Point* sits its assassin, *U-853*, in about 130 feet of water. The last U-boat sunk in American waters during World War II, *U-853* is a very technical dive due to all the wires, cables and jagged, rusting metal strewn about—and again, weather is always a factor. Even when surface conditions are ideal, visibility at the bottom can be near zero.

One of the more spectacular dives in the area is the Texas Tower 4, located 70 miles due east. It began life as an early warning radar station and

in the 1930s in about 100 feet of water and the schooner *Montana*, which went down in the 1870s in 80 feet of water. Both wrecks are good sites for novice wreck divers because of their generally good visibility and manageable depths.

Shore waters near Montauk are almost always murky, but the surprising array of marine life makes up for the limited visibility. The shallow bays are consistently calm, providing an ideal home for blue crabs, lobsters, mussels, pipefish and seahorses. In season, flounder and squid are also abundant. Amazingly, a number of juvenile tropicals such as butterflyfish, triggerfish, sergeant majors and squirrelfish get kicked up from the Caribbean each year and can be found in great numbers around the rocks and in tidal pools throughout Long Island Sound.

Manhattan Transfer

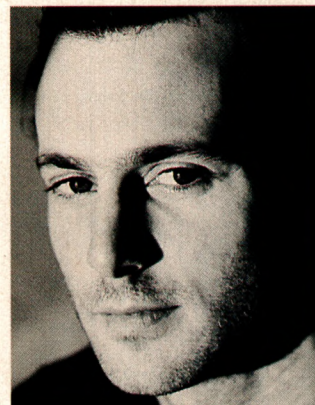
Photographer and former divemaster Alex Kirkbride began working with a printing process called image transfer just this year, and the results beautifully synthesize reality and dreamscape. “I wanted to get away from the glossy Cibachromes with all their fantastic colors and create something closer to what a diver actually feels,” Kirkbride explains.

Born in New York but raised in London, the Manhattan-based photographer learned his trade at the feet of world-renowned photographer Albert Watson: “I worked as his assistant for three years, handling all aspects of the business including black-and-white printing. That’s where I developed my interest in different printing methods.”

Image transfer involves peeling apart a Polaroid Polacolor print and transferring the image to a non-photographic surface such as watercolor paper.

The process is extremely time-consuming: “The word ‘patience’ takes on a whole new meaning,” Kirkbride says with a laugh. And the method doesn’t guarantee the same results every time due to variables ranging from the rolling process itself (sometimes the image doesn’t stick to the paper) to the air temperature in his darkroom. But the effort is rewarded by capturing the ethereal essence of the underwater experience. Kirkbride says, “This seems about the closest a photographer can get to a painterly effect.”

These images and others in the series have recently been exhibited in London and in New Milford, Conn., and Kirkbride sells signed limited editions.

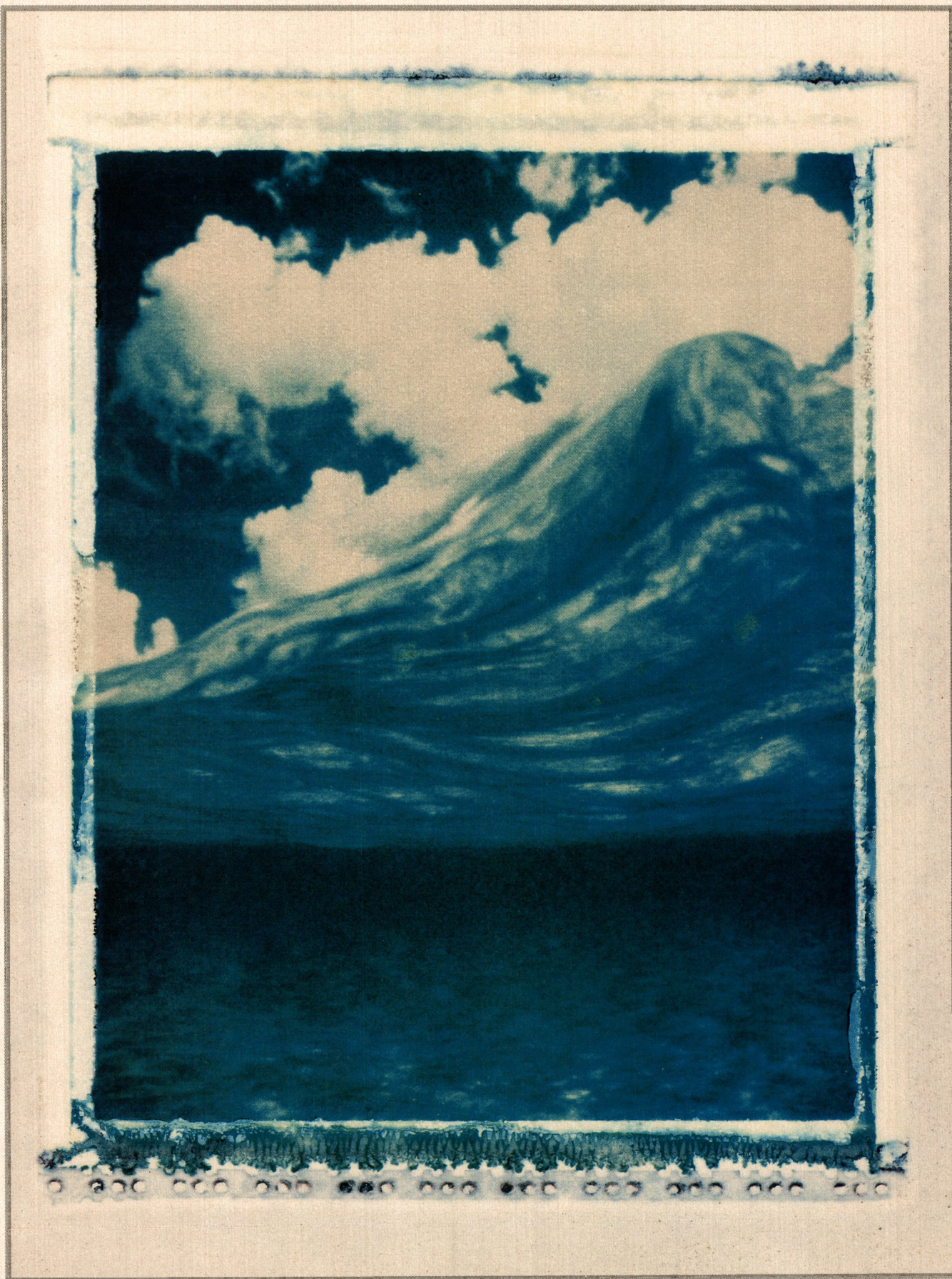


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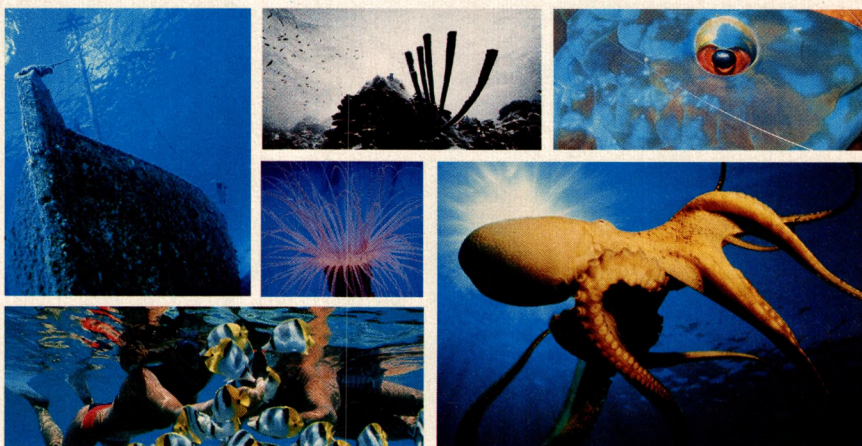
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Mark *each* photograph with your name, address, telephone number, the location where the photo was taken and the equipment and film used to take the photo. (Attach slides to 8½" x 11" paper if needed, and—please—write legibly.) All entries must be postmarked no later than Dec. 31, 1993. You may enter as many photographs as you wish and you may submit either prints or slides, but remember, **THE ENTRIES CANNOT BE RETURNED.** Duplicate slides gleefully accepted. Winners will be showcased in a spring 1994 issue of *Rodale's Scuba Diving*.

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TOO CLOSE FOR COMFORT?

TEXT AND PHOTOGRAPHY BY CATHY CHURCH

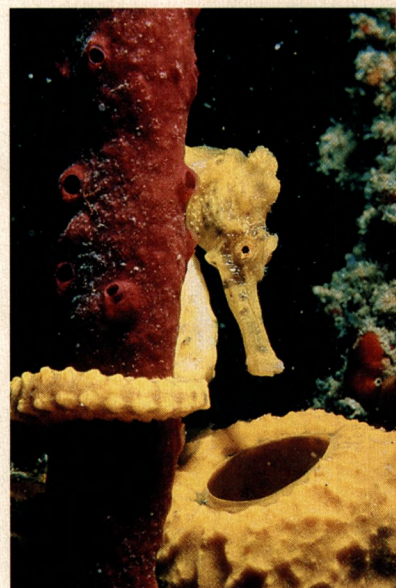
Look at any collection of stunning underwater photographs, and your eye will linger on the intricate details of a well-made close-up. A razor-sharp photo that captures the colors, patterns, textures and intricate details nature packed into small critters is well worth the effort. Getting up close to photograph delicate marine life requires special care—not just to ensure eye-catching photographs, but also to ensure that you don't harm the creature you're shooting. A few simple guidelines will help you get the shot, while leaving your subject as photogenic as you found it.

There's little room for error when taking close-ups. Focusing must be exact. The closer you get, the less depth of field you have. With a one-to-two extension tube on a 35mm lens set for $f/22$, depth of field is only three-eighths of an inch. Steady hands are a must to hold the camera so that the subject stays within the shallow depth of field.

Also remember that as the picture area gets smaller, the slightest side-to-side movement can cut off a large part of your subject and ruin the composition.

The first step to getting great close-ups is to control your subject and your body so that you can position your camera carefully and accurately. If you plan to kneel in a

With a little
TLC, you can get
captivating close-
ups and keep a
clear conscience.



ABOVE: SEAHORSES CAN BE COAXED INTO PRETTY SETTINGS BUT SHOULD NEVER BE TOUCHED.
LEFT: PRACTICE GIVING A DELICATE TOUCH BEFORE HANDLING SMALL CREATURES.



bare or sandy area next to your subject, keep your weights close to your back so they help your balance against the weight of the camera in your hands. If your weights are positioned to the sides or front, they'll pull you forward, forcing you to touch the reef to brace yourself.

If there's nowhere to kneel, hover above the reef and brace yourself with

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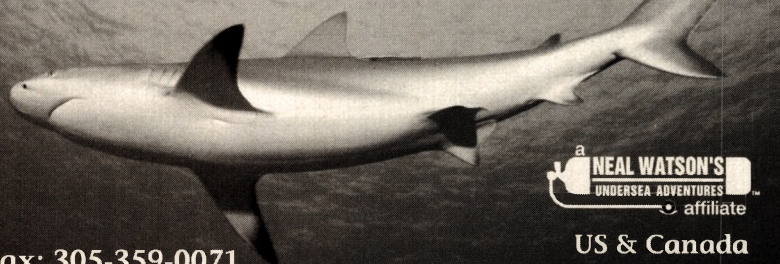
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one or two fingers on a bare spot. Make sure the spot is actually bare by examining it *carefully* and *closely* before touching. Given a piece of "dead" rock may be home to fragile small shells, coralline

FOOD FOR THOUGHT

The tail of a fleeing fish is probably the most common underwater photo. To avoid tail shots you can wait patiently for hours, use a single lens reflex (SLR) camera with a telephoto lens, or lure fish closer with food.

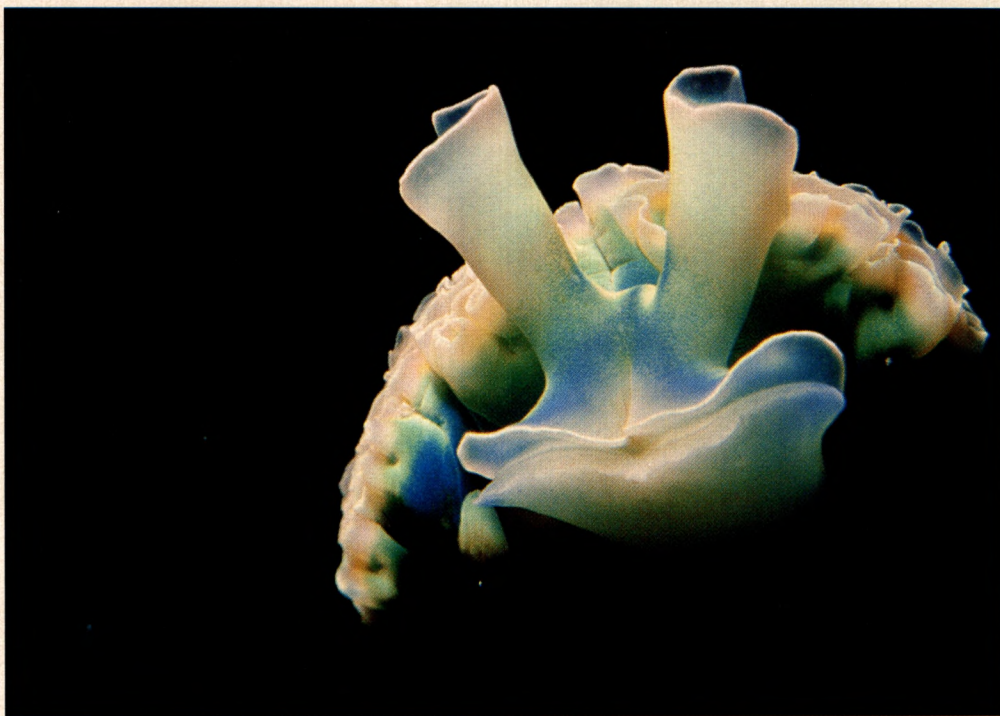
While some people feel that feeding wild animals is harmful because it artificially affects their population or behavior, others feel that the joy of relating to the fish helps us become better stewards of the Earth. Since we feed fish in relatively few areas of the underwater world, our impact is minimal compared to the dramatic effects of sediment and pollutants. The decision on feeding is yours, although each destination has its own special food or may forbid feeding.

If you choose to lure fish with food, choose your menu and containers wisely. Don't use plastic bags. Aggressive fish will swallow the food bag whole and can die if the bag blocks their intestines. Loose bags are dangerous pollution. Hundreds of turtles die each year from eating clear plastic bags that they mistake for jellyfish. Also be careful not to lure an animal into a place where it may be exposed to predators.

Canned, pressurized cheese works well as bait. Contrary to rumor, it doesn't hurt the fish and you can use the nozzle to control the feeding. Bread spreads out everywhere in the water and is difficult to handle. Bits of meat or fish make the fish too aggressive and are hard to put away when you want to stop feeding and start shooting.

Getting close to fish is easy at a busy reef where hordes of friendly fish are accustomed to crowds of divers and snorkelers. I've hand-fed bird wrasses, Pacific puffers and numerous butterfly fish at Hawaii's busiest reef. I have even hand-fed a rock beauty, ordinarily a shy fish. But if you dive a virgin site in remote areas like Vanuatu you will be lucky to get within two feet of any fish, much less put your framer around it. At these sites you will need an SLR and a narrow lens to fill the frame with an eight-inch fish that's two feet away.

algae or even an encrusting sponge, don't simply grope for a handhold using a gloved hand—you *will* crush something. With proper weighting and precise buoyancy control, you can achieve neutral buoyancy without having to add



A LETTUCE SLUG CAN BE LIFTED INTO THE OPEN WATER, BUT SHOULD NOT BE PLACED ON CORAL OR SPONGES.

air to your buoyancy compensator (BC) or kick. If you customarily overweight yourself, just adding air to your BC to become neutral will force you into an

upright position and you'll have to kick to keep your legs off the reef. Moving fins can damage the reef—even if they don't touch it—and you'll have trouble

framer around the plume worm without touching it. If you're using an SLR camera, hold steady and move in close enough so that the plume worm fills

holding your camera steady.

Don't try to use a macro system with a framer while hovering unless you stabilize yourself with a fingertip. It's virtually impossible to hold steady while floating freely in the water, and you're likely to hurt your subjects as you lean on the framer for support. One good way to steady yourself is to dig two fingers into the bare sand bottom. Properly balanced, you can photograph even the most difficult subject such as a sensitive Christmas tree plume worm. Settle gently or use a two-finger grip so that you're in complete control and can place the

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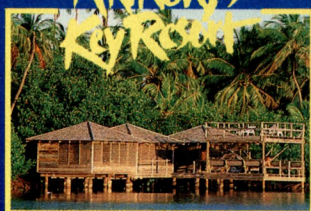
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your frame. Your bubbles or the flash of the strobe may make the plume worm pull in. If it does, remain motionless and it may open up again. If you wobble and touch the coral or the plume worm's tube, it will pull in farther and you'll miss the photograph.

Handling Creatures

Many interesting creatures live in nooks and crannies that are inaccessible to the photographer, especially the photographer using a lens with a framer. We're all tempted to move creatures around for a better angle or a prettier background. My first advice is: Don't handle the creatures. However, many photographers insist that whatever can be done without harm is OK. So my next piece of advice is: Don't handle any creature unless you know how *not* to harm it.

Know when not to try. While hermit crabs and snails can be handled easily, many creatures shouldn't be bothered at all. The octopus holds on so tightly that you may have to injure him to get him loose. I once watched a zealous divemaster force a reluctant octopus out. He succeeded, but the octopus suffered a herniated eyeball. Creatures that elude you after a few tries will only continue to scramble when you get them out. Move on. If they won't stay still, they'll be hard to photograph anyway.

Don't assume that you can duplicate any shot you've seen. For example, that great picture you saw of a flaming scallop may have been taken of a scallop that was found loose inside a wreck. Sometimes scallops are easily moved for the photo and then returned safely to their home. However, most flaming scallops are firmly attached by strong threads. If you hold it firmly enough to rip it loose, you will probably break the shell. It's better to find a more accessible subject.

Determine whether you can get your subject out without hurting it. Creatures that hide in the back of holes cannot be pulled out—they must be pushed out. If you try to pull a shrimp, crab or brittle star out of its hole by grabbing one leg, the animal will give up the leg rather than come out. Put your camera down and take off your gloves. Your fingers will be sensitive enough to handle creatures

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without hurting them. Be careful around sponges. Even your fingers can cause damage if your hands are too large, or if you're bouncing around.

Maneuver a harmless tool—like a bare finger, soda straw or pencil—from behind the creature and chase it out.

**Divers often
unknowingly harm small
creatures even when
they are careful. If you
think you might have
trouble, don't try
for the photo.**

Under no circumstances is a knife considered a harmless tool. Touch the far side of the animal to make it go in the opposite direction. To coax brittle stars out into the open, touch the central disk ever so lightly on the side opposite the direction you want it to move. They will resist going into bright areas, so be patient and know when to quit.

You will hurt some animals just by picking them up. Water creates considerable resistance, and if you hold a small animal by one leg, the appendage can easily break if you move it sideways. Even your bare fingers can tear the exposed mantle of a flamingo tongue if you try to pull it off a gorgonian. Instead, use both hands to gently surround your creature to move it. If you lift a rock to look for critters, be careful where you put it. Lift it straight up, keep predators away and when you're done, gently place it back down exactly the way you found it.

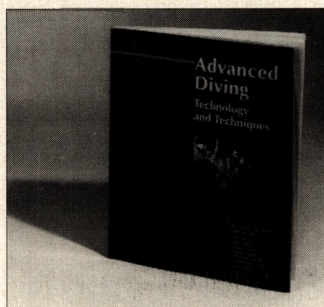
Divers often unknowingly harm small creatures even when they are careful. If you think you might have trouble, don't try for the photo. Let the little critter live another day and photograph some of the millions of subjects that are already out in the open.

Protect the creature while it is out. Creatures hide in holes for very good reasons. If you bring one into the open, you must watch for predators. Fish throughout the world will charge into your framer and gobble up an exposed shrimp or attack an octopus that otherwise would stay safely hidden in the coral.

Well-meaning photographers are often guilty of placing a creature on an attractive but harmful background.

Coral, for example, will sting soft-footed animals, so don't set creatures such as a flamingo tongue or nudibranch on a coral head. Certainly, don't put an animal near an anemone—it will devour your subject right in front of you. If your nudibranch contorts and squirms when you put it on a sponge, obviously the sponge is hurting it. Move your creature only if you're certain the setting is safe. For example, in the Caribbean, you should place lettuce

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slug nudibranchs only on algae.

Return the creature to its exact home. The only place you can be certain is the right place to leave your creature is exactly where you found it. Banded coral shrimp are often in pairs, so you don't want to separate them. One hole may look like just another to you. But one may be the lair of the very animal that eats the creature you are handling. Mark the location with an object such as a slate or glove, and don't stray too far from the creature's home.

The techniques required to take close-ups of small marine creatures are as varied as the subjects themselves. Each situation presents a unique problem. But the enthusiastic underwater photographer can develop the skills of working with these animals without harming them. ©

Underwater photographer Cathy Church operates Sunset Underwater Photo Center in Grand Cayman. Her photos have been widely published internationally and she teaches photo courses in Grand Cayman.

MEXICO MEXICO MEXICO MEXICO MEXICO MEXICO

Plaza Las Glorias

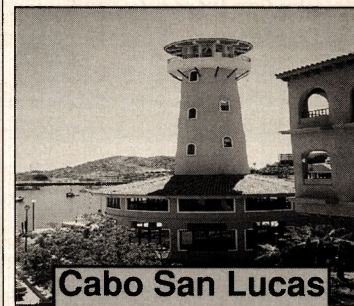


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HURRY SUNDOWN

BY ERIC HANAUER

If you're like most divers, on a typical day of your vacation you'll probably get a couple of dives under your weight belt while the sun is high in the sky and then head for the bar to watch old sol melt into a tropical sea. But if you watch the sunset from anywhere other than the reef top, you're missing one of the high points of the day's underwater activity (see "Night Moves," page 56). With a little foreknowledge of what you're looking for—and a few techniques to keep you safe—twilight diving turns the same old reefs into a whole new world.

ERIC HANAUER

CHANGING OF THE GUARD

As the sun sets, daylight creatures frantically look for a safe place to sleep, while the night shift emerges to scavenge breakfast. Everybody is trying to avoid becoming the main course, and a few members of both shifts have mating on their minds. Activity around the reef reaches a frenetic peak with hordes of creatures dashing about.

The twilight reef can best be described as a changing of the guard. Some tropical animals—including crabs, lobsters, flashlight fish and sea urchins—sleep all day and come out at night. Others, like basslets, parrotfish and puffers are creatures of the daylight hours and sleep at night. A few are awake all the time, but drastically slow down when it's not their work period. These include squirrelfish that hide in caves by day and hunt by night, and groupers who are active by day and just hang around at night. But at twilight, most of them are on full alert, hustling food, shelter or sex. It's a time of maximum danger for small reef fish as predators take advantage of rapidly changing light levels. The same thing occurs at dawn, but far fewer divers are there to observe the process. This says more about the circadian cycles of humans than it does about the fish.

HERB RAFAEL

SUNDOWNERS

One person who has extensively observed the twilight—or "crepuscular"—reef is biologist Edmund Hobson. Where most of us see chaos and disorder as reef inhabitants scramble to find a bed or their breakfast, Hobson sees a pattern as



plain and predictable as commuters hitting the freeway at five o'clock. He breaks down the activities into five overlapping stages: (1) vertical and horizontal migrations of diurnal (daytime-active) fish, (2) diurnal fish looking for cover, (3) evacuation of the water column, (4) nocturnal fish emerging, and (5) vertical and horizontal migrations of nocturnal fish. In simpler words, the daytime fish move down and in looking for cover, eventually

AT TWILIGHT, CREATURES OF THE DAY AND DENIZENS OF THE NIGHT MEET DURING THE DAILY SHIFT CHANGE.

As the sun sets on a tropical sea, activity on the reef reaches a frenetic peak.



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disappearing into the reef. Then the nocturnal fish emerge and spread out looking for food. At dawn, the events are repeated in reverse order.

About 10 minutes after sunset, activity rapidly decreases as the day shift finds their berths for the night. For the next 15 to 20 minutes, the water is essentially devoid of small fish, and movement comes to a virtual standstill. Hobson calls this the quiet period. The eyes of predators are better adapted to twilight, so small fish—whose eyes are adapted to daylight—are in deep trouble if they remain in the open. With the sun below the horizon, dark-colored predators moving close to the darkened reef are difficult to see from above, while their prey are silhouetted against the light of the evening sky.

In temperate waters, this changing of the guard is less obvious. Hobson theorizes that because twilight lasts longer at temperate latitudes, small fish have more time to adapt to the gathering darkness and predators lose their advantage. He believes that predators are the driving force behind twilight migrations on tropical reefs.

According to Gene Helfman, approximately two-thirds of fish species feed in the daytime, a quarter to a third feed at night and 10 percent are crepuscular. Most night feeders are carnivores while most of the day feeders are herbivores, and there are more of them. Yet, even for daytime feeders, spawning generally takes place at sunset or at night. One possible explanation is that fewer planktivores are swimming about at that time, giving the eggs a better chance of survival. Adult fish are in danger from predators while mating, but they seem to disregard their own safety and mate anyway—whether for the survival of the next generation or the sheer thrill of submarine sex, we don't know.

LIGHTS OUT

At twilight, the underwater world is even darker than it is topside. With the sun at a very low angle to the surface of the water, much of its remaining light is reflected from the water's surface and doesn't penetrate. Although colors will be muted, there's still plenty of light for divers. However, it's a good idea to

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bring along a light; if you enter the water late enough and manage your air supply well, it will end up as a night dive. Even then, you may not need the light.

During the twilight portion of the dive, your eyes will gradually adjust, allowing you to see details after dark that you wouldn't be able to see on a normal night dive. Your eyes need about half an hour to adjust to darkness. In bright light—even artificial light—your vision is provided by the color-sensitive cone-shaped structures in the middle of the retina. They're sort of like a slow, fine-grain color film; they can register great nuances of detail, but not in dim light. Rods, located at the edges of the retina, are more like a fast, grainy black and white film, registering only shades of gray. Rods are blinded by bright light, but recharge after half an hour of darkness. Exposure to bright light—including dive lights—can quickly wipe out night vision for up to 30 more minutes so it's best to leave your light off under water if you want to see

the whole reef.

For your eyes to make the same sort of adjustment on a regular night dive, you'd need to sit in the dark, or in a room illuminated with red light, for half an hour before going down. (The rods of the eye are unaffected by red light.)

What if you need a light momentarily to peek into holes or crevices? Keep one eye closed while shining the light. After you turn it off, that eye will retain its dark adaptation, and you will still be able to see clearly. The eye that was open will be effectively blind for a while, but the only aspect of your vision that suffers is depth perception.

Many night creatures will avoid the beam of a diver's light, remaining just beyond its periphery. I've made twilight and night dives in clear water with a full moon and observed vast schools of shadowy fish darting around the top of the reef. When I turned on my light, they disappeared, and the light revealed only a few lethargic critters. As soon as the light went out, the crowds returned.

LIVE-ABOARD LEISURE

With their instant access to the water and lack of distractions, night diving tends to be popular on live-aboard boats. Still, after a four-dive day and a pleasant dinner, it's sometimes difficult to motivate yourself to get into a cold, damp suit for a night dive. But at twilight, you can have your dive and your dinner too. It's as easy as stepping off the stern after the boat is anchored for the evening.

Just make sure you have enough surface interval from your previous dives, and don't push your computer. During the first two or three days of a live-aboard trip, everybody is gung ho to make those five dives a day. After that, overload may begin to set in. This would be a good time to back off the nitrogen saturation and skip a dive or two during the day, saving more bottom time for the twilight jump. You'll be back on board in time for that comfortable dinner and a good night's sleep.

FILM AT ELEVEN

It's difficult to capture all the excitement of twilight diving on film. This is one instance where video does a better job than stills of depicting the movement and excitement. Many video cameras will capture good images with far less light than that needed to properly expose slide film. You can take advantage of this difficult situation with fast film and slow shutter speeds to create ghostly images of silvery fish, imparting a sense of movement to a still photograph. But the bottom line is that art and accurate depiction take a backseat in twilight diving; personal experience and enjoyment are what it's about.

Whether from a beach at home, from a land-based resort, or from a boat, crepuscular diving is a different and exhilarating experience. Compared with the slow pace of most night dives, this is a fast moving, high energy show, with a huge and varied cast of characters. The next time you have the opportunity, jump in and enjoy. 

Eric Hanauer is an associate professor of physical education at Cal State-Fullerton, where he runs the school's diving program.

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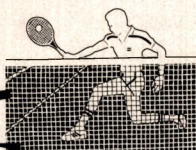
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SUBMARINE SUMMER SCHOOL

BY DEBORAH COULOMBE

Ah, summer camp: woodland hikes, a refreshing plunge in an icy pond, canoeing and camp outs, chilly nights and drafty cabins. That's fine for the terrestrially inclined. But for Chris Cornelisen, summer camp means coral reefs and scuba diving. As a marine science instructor for Seacamp on Big Pine Key, Fla., the 23-year-old Cornelisen plans to spend this summer diving with teenaged campers in the Florida Keys.

Run by the Newfound Harbor Marine Institute and designed to teach youngsters about the ocean, Seacamp attracts staff and campers from throughout the United States and other countries.

GO SOUTH YOUNG MAN

Cornelisen, from Park Ridge, Ill., is a graduate of Iowa's Drake University—about as far away

from an ocean as you can be in the continental U.S.—where he studied biology and business.

"I got certified my sophomore year of college in hopes of going to St. Croix for a semester of marine biology," Cornelisen recalls. "I did my open-water checkout in Pearl Lake, Wis., a spring-fed lake containing five acres of frigid water and about 200 other divers."

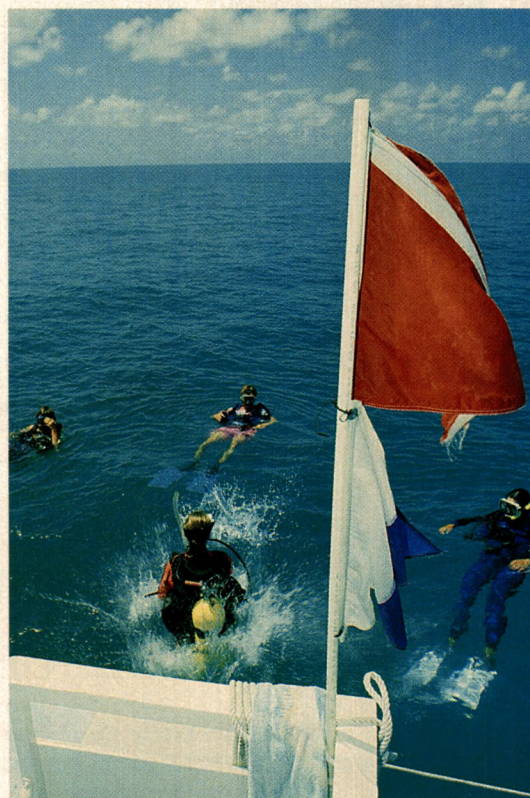
That was the summer of 1989; Hurricane Hugo—which trashed St. Croix before heading north to cream Charleston—put an end to Cornelisen's semester in the Caribbean, but the certification soon came in handy. After graduation, he took a job at Seacamp teaching campers who are already certified.

Here in the relaxed lower reaches of the

For a few
lucky teenagers,
Seacamp combines
underwater
education and
remarkable
diving.



SEACAMPERS FOLLOW A HAWKSBILL TURTLE ON HIS AFTERNOON ROUNDS (ABOVE); JUST AFTER ROLL CALL, CHRIS CORNELISEN ASSEMBLES HIS CLASS IN THE BATHTUB-WARM WATER OFF BIG PINE KEY, FLA. (RIGHT).



PHOTOGRAPHY BY BILL KEOGH

Keys, the kids learn marine biology and how to be more accurate observers. That impresses their parents. For the teenagers, the tropical atmosphere and warm, clear waters are a blast and, as a bonus for everyone, the course helps refine their scuba skills.

While Cornelisen originally planned to move on after that initial Seacamp summer, the water of the Keys enticed him to stay through the year and into the following summer.

SCHOOLMASTERS AND NURSE SHARKS

At 2:10 on a Monday afternoon the camp bell, the top half of an old scuba tank, signals the beginning of the afternoon program. In the harbor aboard one of seven 26-foot flattops, Cornelisen makes last-minute preparations for the first of three reef ecology classes planned for the week. As he double-checks the number of underwater slates and waterproof fish-identification guides on board, snapper, grunt and parrotfish graze and glide along the seawall; a hundred mullet leap in unison

from the harbor surface, their splash sounding like applause.

Six boys and three girls drop their mask and fins on the boat and head to a rack to pick up camp-issue scuba gear. Cornelisen, scuba instructor Todd Huffstetler and an assistant have their hands full ensuring each student arrives with all the necessary equipment. Fitz, a veteran of five Seacamp summers and several of Cornelisen's classes, records pre-dive data for each diver on a clipboard.

The boat soon leaves the harbor with Huffstetler at the helm as Cornelisen fields questions about what they'll be studying today (fish morphology) and where (Looe Key). As the boat rounds Marker 24, the spurs of coral and sand channels that characterize this reef shimmer beneath the tropical water. Students on the boat's port side glimpse a large green sea turtle stroking over a bed of turtle grass as it heads north toward the back reef.

After tying up to a mooring buoy, Cornelisen uses a portable chalkboard to sketch the most common fish body

types.

"I don't like to get in the habit of just telling the kids the name of a fish—you know, 'This is a great barracuda, this is a French angel,'" Cornelisen explains. "I'd rather have them observe the fish and be able to tell me things like whether it's an herbivore or a carnivore, to prove they're doing more than just repeating information back to me."

When Cornelisen finishes his preview, Huffstetler reviews buoyancy control techniques. "We have briefings before each dive; you have to stress neutral buoyancy and self-awareness as far as gear is concerned," Cornelisen says. "In general, though, the kids come down here with the right attitude. They know our primary concern is maintaining the health of the reef, and they respect the sanctuary."

The campers' diving experience varies widely. One camper in this group had been certified just two weeks earlier at City Island in the Bronx, while another is spending his fifth summer at Seacamp.



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The thought of diving with a group of adolescents, many of them newly certified, can be daunting, but Cornelisen agrees with Seacamp scuba director Todd Foust, who says, "Kids pick up skills a lot quicker than adults, they tend to be in better physical condition and they're much more willing to learn."

HAPPY CAMPERS OVERBOARD

After Huffstetler's briefing, Cornelisen gives a few final instructions and the OK to gear up. In a few minutes the groups descend 25 feet to the sand bottom. Cornelisen and his group swim along the coral spurs, noting the very obvious schools of sergeant majors, blue tangs and parrotfish and searching for more elusive reef dwellers like eels, sharks, squirrelfish and gobies. Several of his divers make close acquaintance with a barracuda; topside chatter is replaced by wide-eyed expressions and emphatic gestures.

Having made their way back and forth along one spur, the groups meet near a stand of elkhorn coral for the ascent. Slates full of notes and fish-identification guides in hand, the students make their way up to the boat where they review what they've seen. Teaching under water affords little opportunity for feedback until the dive is over, so Cornelisen looks forward to these post-dive discussions. "The kids are quite insightful," he explains. "They often spot things I wouldn't have seen otherwise."

Half an hour later, pleasantly exhausted by the dive and the sun and lulled nearly to sleep by the hum of the boat's engines, the campers struggle to

alertness as they near Seacamp's harbor. At the seawall a gear train quickly empties the boat and the campers head off to rinse and return their equipment. Dinnertime comes soon, the air filled with conversations describing new observations and sensations. For most, bedtime follows soon after, perhaps to dream of the next day's adventures.

NOT JUST A JOB, AN ADVENTURE

For Chris Cornelisen, Seacamp initially served as a testing ground; now he can't imagine working in an office somewhere on the mainland. "Being down here has allowed me to look at diving a whole different way. Back home I thought of diving as pleasurable and perhaps occasionally character-building, but down here you can actually teach—and learn—under water. It turns out to be far more interesting than just looking around and breathing off a regulator."

The Seacamp experience doesn't come cheap—an 18-day session costs nearly \$2,000 excluding transportation, and scuba privileges add another several hundred dollars. The six-acre Seacamp site is far from luxurious—it's a camp, after all—but what it does offer is a location and learning experience without parallel for young people interested in the sea. And, for a few lucky counselors like Cornelisen, it affords a summer job in paradise. ☺

Deborah Coulombe is a marine science educator and author of The Seaside Naturalist. The address of the Newfoundland Harbor Marine Institute is Route 3, P.O. Box 170, Big Pine Key, FL 33043, or call them at (305) 872-2331.

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NIGHT MOVES (Continued from page 59)

banded morays, scorpion fish and blue mantle octopus, and you may encounter several multicolored parrotfish sleeping peacefully in their nighttime cocoons.

The colors here in the Pacific burn bright under your dive light; you may spot an unusual sea urchin with a dark maroon body and electric blue dots outlining a five-pointed star on his

body, or a 10-inch red crab loitering along the bottom. Whatever you do, don't forget your camera—your buddies back home might think you're spinning some fish stories unless you have photographic proof of this racy place.

● SHINKOKU MARU, TRUK LAGOON

We couldn't get away with selecting 10 night dives without mentioning the

fleet of wrecks in Truk Lagoon. They provide divers ample opportunities to explore historic ships at various depths, and the water's always warm. By day, the wrecks are ethereal, some say spooky. Night covers the wrecks with even more mystery and suspense, and the colors are eye-poppingly glorious under the glow of your dive light.

Probably the most beautiful wreck is the *Shinkoku Maru*. The 501-foot tanker rests on even keel in 40 to 125 feet of water and is wonderfully preserved. The bulwark and masts are luxuriant with red, orange and yellow soft corals. The deck itself is fairly clean of coral growth, but everything built on it—particularly the gun and the stumps of the stanchions—is heavily overgrown with soft corals, sponges and various types of oysters. Exploring this huge vessel thoroughly, with all its hatches, compartments and rooms, demands multiple dives.

● HERON ISLAND BOMMIE, AUSTRALIA

Queensland is home to the speck of land known as Heron Island. Fifty miles off the coast of Australia, it nestles within a protected lagoon on the Great Barrier Reef. The Big Bommie is probably Heron Island's most famous dive site, but many visitors see it only when the sun's up. It's a totally different, and totally worthwhile, dive at night.

Located in about 35 feet of gin-clear water, the five coral heads that rise from the sloping reef are covered with yellow sunshine coral extending their polyps to feed. Hermit crabs and cleaner shrimp reign supreme. Watch your camera extension tubes; at least one monster hermit crab has been known to bend them with his claws. The near-legendary resident moray eels, known as Harry and Fang, are always active at night, and divers shouldn't worry about the whitetip sharks that seem to be extremely attracted to dive lights—they come in close, but they're only inquisitive. ☉

Associate editor Robert Mack's play *Why They Call Us The Blues* premieres this month in Savannah, Ga.

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Q & A: UNDER PRESSURE

HEADS UP

BY JON HARDY

Q: *As an instructor who's spent years teaching divers, I've seen our sport grow, equipment evolve, techniques come and go, and the safety record for recreational diving improve. Yet one aspect of diving safety seems to have worsened: divers being injured by boats. Has the boat accident rate increased and, if so, what can we do about it?*

A: Your observations are shared by many in the dive community who deal with accidents. Unfortunately, good statistics aren't available, mainly because most boat accidents involving divers aren't fatal and don't require spe-



COURTNEY GRANNER

cial treatment such as recompression. We only learn of such accidents through chance conversations and legal cases.

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ourselves why. The most obvious explanation is that the sport has expanded greatly over the past decade or so, and more boats and divers suggest a greater likelihood of accidents. Drift diving has also grown over the years. This means that dive boats must move about on the surface while divers are down.

There's another consideration. Divers can now travel greater dis-

As equipment
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greater distances from
their entry point,
the likelihood of
boat accidents
involving divers
increases.

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tances from an entry point or a boat where the dive flag is displayed thanks to newer equipment including powerful fins, diver propulsion vehicles, better buoyancy compensators, dive computers and larger tanks. Divers are also being taught underwater navigation and night diving skills, air-saving breathing techniques and better buoyancy control, which increase the amount of territory they can cover. And let's not forget about divers who snorkel on the surface to and from the dive site.

Human error is the primary cause of diving accidents, so how divers ascend is important. Loss of buoyancy control during an ascent can put a diver in the wrong place at the wrong time and cause a collision with a boat.

The old diving adages, "Stop, look and listen" and "Look up, reach up and go up," fit right in with more recent techniques such as safety stops. The safety stop was conceived to help reduce the risk of decompression sickness, but it also reduces the risk of air embolism and helps prevent divers from becoming entangled or striking a boat upon surfacing.

For an ascending diver, safety at the surface begins with slowing and controlling your ascent rate and being capable of stopping your ascent once you reach shallow water (current standards call for a safety stop between 10 and 20 feet). Proper weight selection and correct use of the BC, swimming and breathing techniques will help you control your ascent. During the safety stop, look up and 360 degrees around while listening for boats. Surfacing slowly and alertly, and with a hand up, completes your safe ascent.

Despite a diver's best efforts, there's still a risk of being hit by a boat, especially in rough seas. Thus, anything that makes a diver more noticeable will likely reduce accidents. Wearing brightly colored dive gear is helpful, as are inflating your BC to ride high on the surface, staying with your buddy or group, using a day marker or signal mirror, using hand signals and blowing a whistle. At night, divers can signal with chemical lights and both primary and back-up lights. Lights can be flashed at boats but shouldn't be directed at the operator or crew members.

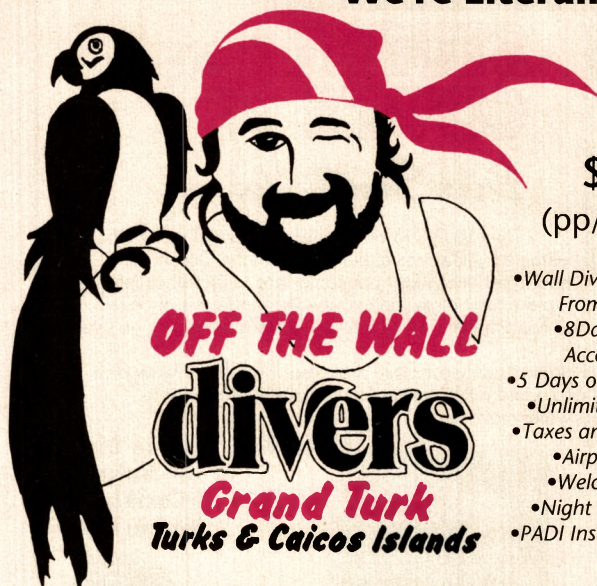
On the surface, divers need to be aware of all boats in the area, particularly their own dive boat. A diver can swim away to avoid a boat, but re-submerging should only be done in an extreme situation.

If the dive boat has to get under way due to an emergency, or if you're diving from a live (running) boat, stay clear of the boat until signalled to approach by a crew member. During boarding, stay clear of the props. To do so, swim toward the dive step or ladder and remain in a horizontal, instead of vertical, position until you board.

A couple of final obvious but crucial "don'ts": Don't swim just under

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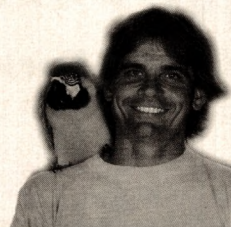
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the surface, where you can't be seen but can still be struck by a boat, and don't surface directly under a boat, particularly if the engines are running.

HEAVY METAL

Q: For years I've used my steel tanks when diving near home and aluminum tanks when on dive vacations. During my last trip I took an advanced course. The instructor criticized steel tanks and made them sound like rust buckets about to explode. Should I scrap my steel tanks?

A: Just as no one mask is right for every diver, no one size or type of tank is right for everyone either.

It's easy to get confused when comparing steel tanks to aluminum ones because many characteristics—such as buoyancy, weight and capacity—will vary with tank size and the specifications of the particular tank. Let's compare the standard 80-cubic-foot 3000-psi aluminum tank and the 76-cubic-foot 2640-psi steel tank.

Aluminum tanks have several advantages over steel. They hold about five percent more air than comparable steel ones. Aluminum tanks don't rust and they hold paint well. They're also less expensive. Most importantly, aluminum tanks are the most common, so most divers' BC packs and weight belts are adjusted for this tank.

But there are disadvantages. Aluminum tanks still corrode and their valve threads sometimes erode. They may be easier to service, but often require more frequent servicing than steel tanks. Aluminum tanks are larger—both taller and thicker—and 14 percent heavier than comparable steel tanks. They're also more buoyant, requiring divers to use an average of four additional pounds of weight. It's also more likely that an aluminum tank will have a "short fill," as it requires more than 20 percent higher pressure to be full.

There are models of aluminum and steel tanks that have solved these problems, but the solutions change the size, working pressure, capacity and buoyancy. And all of these improved tanks cost more than standard models.



REGULATORS (Continued from page 52)

than older hoses of the same size.

U.S. DIVERS MICRA AND SEA2

The second stages of these two regulators look very different, but they share many of the same features.



The Micra is the smallest second stage available. In open-water tests it breathed well and dry in all positions and cleared easily; it's light and comfortable in the mouth, but it

does tend to pull to the right a bit. Bubble interference was the Micra's weak point, but it still landed in the middle of this group for its ability to divert exhaust bubbles. Also, the small min/max switch on the Micra is hard to find and use.

The SEA2 did a much better job of diverting exhaust bubbles, but was otherwise an average performer on the open-water tests. Testers' reactions to the mouthpiece were mixed. Both models have what U.S. Divers calls a "Comfo-Bite" mouthpiece which is different from any other mouthpiece we've seen. It was well-liked by one tester. One other thought it took some getting used to, but all other testers found it uncomfortable. This mouthpiece can be changed to a more conventional mouthpiece very easily.

First Team

Anonymity is often the friend of the journalist—it helps to do the job without undue scrutiny. But we do want to give you the roster of folks who made possible these groundbreaking inquiries into the performance of scuba regulators, putting in far more time than they could ever be compensated for.

Glen Egstrom, Ph.D. and professor emeritus at UCLA's Human Performance Laboratory, was mentor and totally unselfish supporter. Frank DiCrisi, diving safety officer at

UCLA, was the breathing machine technician who did literally thousands of machine runs and helped with ocean testing. Lorraine Sadler, hyperbaric technician at USC's recompression chamber, was the technician preparing and keeping all the regulators in working order, as well as helping Frank on the breathing machine and doing ocean testing. The other divers who helped us with ocean testing and data gathering were Rodale's

Scuba Diving's West Coast editor John Brumm, divemaster Mike Brook, and underwater instructors Susan Lawson and Jack Reiting. 

Jon Hardy, former executive director of NAUI, has been an instructor since 1961 and is currently an instructor evaluator for SSI. Barry Shuster is a PADI course director and managing editor of PADI's The Undersea Journal.



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RESEARCH SUGGESTS THAT EVEN COMMERCIAL FLIGHTS LIKE THIS CAN PRODUCE BUBBLES IN DIVERS. A RECENT STUDY INVESTIGATES WHEN IT IS SAFE TO FLY AFTER DIVING.

TEST FLIGHT

Knowing how soon you can fly after diving is an issue of safety. When you fly after diving you reduce the air pressure around you. That pressure kept the extra nitrogen from your dive dissolved in your body. So when you fly, nitrogen can come out of your tissues into your blood faster than it normally would. That's not good.

If dissolved nitrogen becomes gas bubbles before you can breathe it out, it could result in decompression illness (DCI). An obvious solution is to wait a maximum of time before flying. But flying after diving is also

an issue of convenience and planning for dive travel. And for the military, flight delays can affect tactical readiness for sea and air operations.

So how do you know when it's safe to fly? It's a good question and one that can't be answered in a single study. You can't just have people dive then take them flying and see how their day goes. There are simply too many variables. In order to obtain meaningful data, a relationship must be constructed between the "dose" of pressure and the "response" of gas phase formation.

TINY BUBBLES

The pressure reduction that occurs when you surface after a dive may produce small bubbles in your body made mostly of nitrogen. Bubbles that are harmlessly small at depth expand as air pressure is reduced. These bubbles may circulate through your bloodstream and accumulate in places like your joints, nervous system and skin.

Detectable gas phases develop in humans after surprisingly small decompressions. In one experiment, we put male subjects in an underwater laboratory, at a depth of 23 feet,

Extrapolation of our data suggests that pressure reductions commonly attained in flight may be sufficient to form a gas phase in people who *haven't* been diving.

for two days until they were saturated with nitrogen. After subjects returned to the surface, many were found to have bubbles detectable by Doppler ultrasound. The chamber was moved to a 16-foot depth in the second set of runs. Subjects bubbled. Even after coming up from saturation at 12 feet, about half the subjects still bubbled. These results raised interesting questions: What is the minimum pressure reduction that will form bubbles, and can this minimum be reached through commercial air travel?

Pressure reductions occur during routine air travel. Extrapolation of

our data from shallow saturation to altitude suggests that pressure reductions commonly attained in flight may be sufficient to form a gas phase in humans. This prediction is consistent with a recent case report of DCI occurring after decompression to 8,000 feet. But no study has examined if this extrapolation is valid. In other words, we don't know how "extrapolatable" the underwater data are to altitude. So we went to altitude

to try it out.

THE TEST

We put people in an altitude chamber to examine gas phases produced at an altitude of 10,000 feet. The subjects stayed in the chamber at altitude for 12 hours during each run. We measured how long it took before subjects started to bubble and how long they continued to bubble.

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We listened for bubbles using Doppler ultrasound every half hour. Results were interesting. Bubbles occurred in 75 percent of the males within one hour of reaching pressure and persisted until hour nine of exposure. The only female subject was not observed to bubble.

WHAT ELSE DID WE LOOK FOR?

Another question is why some people

are more likely to form bubbles than others. Are things like age, gender, height, weight, body fat and previous injuries really predisposing factors?

In a study we did with 170 subjects coming up from saturation under water we found a relationship between age and bubbles. Subjects older than 30 tended to bubble more than younger subjects for reasons we don't completely understand.

We didn't find any connection

between weight, body fat, or gender and bubbles.

STILL MORE TO DO

From this very preliminary work we make the tentative conclusion that civilian airline cabin pressure may be sufficient to form a gas phase in humans, even with no prior diving. This study will continue with additional runs from 2,000 to 12,000 feet to establish a dose response relationship between altitude exposure at airplane cabin pressures and bubble formation. This work will add important pieces of information to the flying after diving puzzle. Thanks to Dr. Peter Bennett and The Recreational Diving Research Foundation for funding this work.

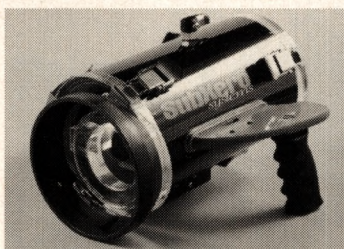
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Divers Alert Network (DAN) is an international tax-exempt nonprofit member-supported diving safety organization based at Duke University Medical Center in Durham, North Carolina. Since 1980, DAN's primary mission has been to help make diving safe for recreational scuba divers. It accomplishes this goal by providing medical consultations for injured divers, by collecting and analyzing diving accident and fatality information, by promoting educational programs, and by offering diving accident insurance and worldwide medical evacuation coverage. DAN is supported in these endeavors by a network of diving medical experts, hyperbaric facilities, instructors, stores, training agencies, clubs and manufacturers.



Topside, these isles seem far more tropical, more Caribbean, than the pine forest islands to the west and north. With the shallow banks at their back door, the Exumas are also one of the great natural harbors of the Caribbean.

This vast sub-chain has a bit of everything: Walls, reefs, shallow and deep blue holes. Not far from the hub of Georgetown on Grand Exuma, the calcium has done its work well on shallow Pagoda Reef. Here elkhorn, star, pancake, leaf and sheet corals have built a pagoda-like grotto alive with parrotfish, angels, gobies and lobster.

At Dog and Puppy Reef, spurs and grooves in 60 to 80 feet of water form sharp valleys punctuated by stands of pillar coral up to nine feet high.

When the weather is unkind on the Atlantic reefs, it's time to head for the blue holes in picturesque Elizabeth Harbor. That's what I did, and within minutes of boarding the boat, I found myself descending to Angelfish Blue Hole. As with most oceanic caves, tidal flows create spring-like outflows or drain-like vortexes at the surface. The idea is to dive in between these extremes.

Under water, the hole is an immense aquarium with bumpnose parrot fish, blue tangs, eagle rays and sergeant majors, the latter diligently guarding their tidy nests on the walls. Biologist Ed Haxby, who leads detailed eco-dives, shows me stuff I've been wondering about for years: How the goatfish use their barbicles to probe under the sand for food; how the newly molted lobster must put a sand grain inside its fresh shell to give it a sense of balance. "I try to show divers uncommon things that are present in the common," Haxby tells me.

Inside the cave mouth, Haxby and I followed a permanent line back for almost a hundred yards. As we reached a depth of 90 feet, a muted red cardinal fish flashed in my light beam; on the ceiling, a lobster strolled upside-down at the edge of an ancient stalactite. Nearby, a large gray angel nonchalantly chewed on a piece of wall, letting me stroke its body with my fingers.

After lunch, I descended over another hole, Crab Cay Crevasse. A

herd of spotted sea hares grazed quietly on the sandy bottom near the rim. A few yards away, a cleaner shrimp peeked out from a ringed anemone while a large spider crab danced a little crustacean jig on its back legs. These are the things that Lewis Carroll, slithy troves and all, could only dream about.

Bottom Time in Margaritaville

Swim due southeast from the tip of Abaco, and a hundred or so miles later,

you'll cross the reefs of Eleuthera and its cays to the north, Spanish Wells and Harbour Island. At Harbour Island's Dunmore Town last year, Jimmy Buffett dropped by the funky waterfront Gusty's Bar, sang some island tunes, and proclaimed this the real-life Margaritaville. During my visit, Gusty showed me his brand-new binoculars, with which he surveys the bonefish flats outside his bar. The flats, says Gusty with a smile, have become a hot locale

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Inside the harbor, dive shop owner Jef Fox tells me the good news and bad news about Hurricane Andrew: A 22-foot-high storm surge washed over the top of the mangroves, leaving battered docks and boats in its wake. But at least the big blow didn't last long enough to create the jackhammer waves that would have crushed the reefs. So while there was considerable property damage topside, the area's

reefs survived in good shape.

Fox, who just discovered what seem to be several Arawak-era skulls inside an underwater cave in the harbor, tells me the waters of Harbour Island, like most Out Islands, are typically unexploited: "It's not like we have to work hard to find a great dive site—they're everywhere."

On Miller Reef, just 10 minutes away, large plate corals in 65 to 85 feet of water grace a reef with a site called

the Arch—a 60-foot-wide natural arch sloping from 65 down to 110 feet and infested with horse-eye jacks, barracudas and schools of spotted eagle rays. At the Grouper Hole eight miles out in the Atlantic, huge schools of grunts and blue runners can be as thick as lattice-work. Groupers come here to spawn on the first full moon in January. And at the famous Devil's Backbone, the shallow three-to-four-mile long barrier reef is full of large branching corals that break the surface, proud of themselves for having drawn ships like the turn-of-the-century *Cien Fuegos* to their graves.

For divers who just aren't happy unless they're zipping through the water like a pinball, there's the five-knot drift dive known as Current Cut off north Eleuthera. Farther south, the vast Eleuthera Wall, as well as a series of offshore pinnacles thick with marine life, are beginning to get more attention from divers.

Walls, Walls and Landfall

Situated off the Banks all by themselves are Cat Island, just south of Eleuthera, and San Salvador, a speck of land farther to the southeast. Cat, named after an early buccaneer, used to be called San Salvador since it was thought to be the site of Columbus' first landfall, while San Salvador—now thought to be the site—used to be called Watling Island. Got that?

At six by 12 miles in size, "Saint Saviour" is also one of the smallest islands in the Bahamas, as well as the most eastern. Highly regarded by seasoned divers for its water clarity, San Salvador is also one of the least developed.

The theme here is wall diving, almost all of which takes place less than a mile off the lee coast. Although the rugged windward shore is thick with reefs—and wild sandy beaches—the Atlantic roars here, making diving difficult on all but the calmest of days. That's okay, though, since sites like the Devil's Claw, scored by spur-and-groove formations as if from a giant claw, and the wreck *Frescante*—a massive ship in 20 feet of water—are among dozens of sites on the 12-mile western shore.

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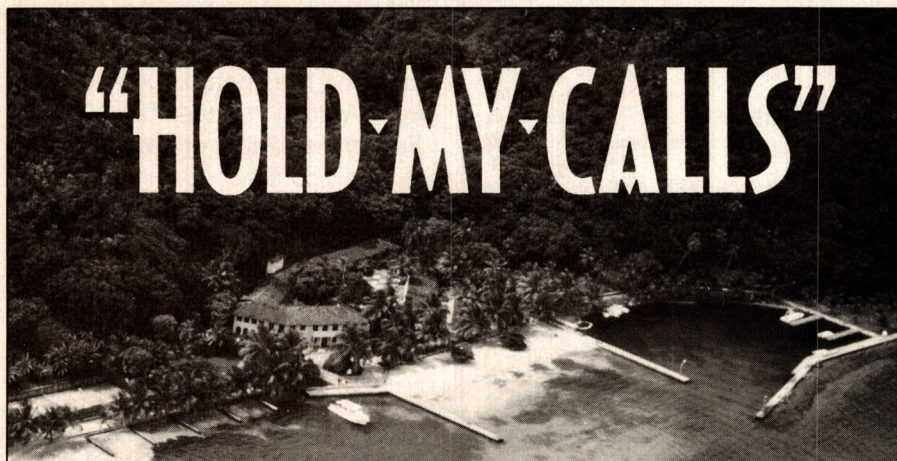
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For me, the most historic dive is the chunk of wall just off the cross marker on Landfall Beach. Here, I settled down near the bottom and imagined that 500 years ago, three Spanish caravels cut through the waters above, their scarred wooden hulls crashing through the tropical waves like humpbacks breaching the surface.

Elsewhere on the island, the 19th-century Dixon Hill Lighthouse and the remains of Loyalist plantations are pop-

ular attractions. San Salvador has been declared a "living museum" by the government, and all new development has to be environmentally correct.

Cat Island, almost as sparsely settled as San Salvador, is covered with rolling limestone hills lush with tropical foliage. One of the longest continuous reefs in the Bahamas rims the pristine eastern beaches but—since few roads lead there—it's seldom dived. Although shops have come and gone like

bananaquit birds flitting about in the papaya trees, until last winter there hadn't been a regular operation here for almost 20 years. As I flew low over the coral-lined shallows in a small plane piloted by Fernandez Bay Village owner Tony Armbrister, he told me the waters are so rich that a lodge guest once stumbled on the wrecks of two

Waters are so rich
that a lodge guest
once stumbled on the
wrecks of two previously
unknown British frigates
while diving near
Winding Bay.

previously unknown British frigates while diving near Winding Bay. Later, driving from the lodge to the healthy reef and steep wall on the southern coast, past the pastel blues and pinks of the rustic homes where islanders still practice a Caribbean-African witchcraft called obeah, I spotted the highest point in the islands. It is Mount Alvernia, a 206-foot ridge where some 50 years ago a mysterious monk known only as Father Jerome carved an ornate replica of an Italian monastery out of limerock.

From the hilltop site of this hermitage where Jerome lived and died, there's a stunning view of both coasts, evoking a glimmer of the spirituality at work here. On an exquisitely detailed tile in a stone wall, a Latin inscription translates as "Thank you Lord for the Moon and the Stars." Up here alone, distant meteor showers in the clear sky must have seemed like fireworks.

I promise myself to return someday to dive more of the southern wall on Cat Island—to discover more natural gifts to add to Father



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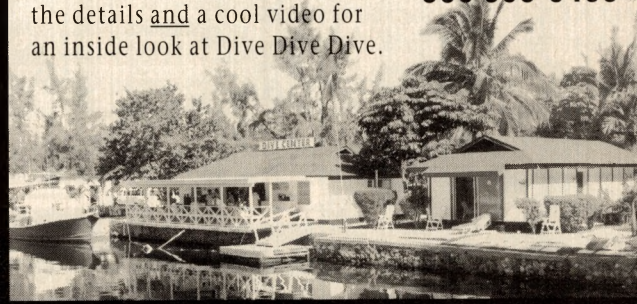
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Some 90 miles long and bisected neatly by the Tropic of Cancer, Long Island is not only one of the largest Out Islands, it's also one of the most southerly. Divers can indulge themselves almost anywhere here except for the rugged, windswept stretch on the western shore, from Dove Cay to Nuevitas Light. Elsewhere, it's just about anything goes—from beach diving on immense coral heads to exploring walls, reefs and coral caves.

But perhaps the best known dive is Shark Reef, where cruising pelagics summoned by chum literally swarm around divers. The sharks are said to be so conditioned by the 15-year-old exercise that the sound of the dive boat's motor alone brings them in droves. For their part, divers simply take their place under water, backed up against the reef, and watch the action.

The long-running dive resort, Stel-la Maris, has charted no less than 27

sites here, and a casual fly-over in a small plane tells me that's probably just scratching the surface. There are almost as many beaches, and they're every bit as untouched as most of the dive sites. There's also a world-class blue hole where deep cave explorer Jim King, using his own rebreather system in 660 feet of water, ran almost a mile of survey line in 1992.

And, if you fly due southeast from Cape Verde at the southern tip of Long Island, beyond the semicircle of Crooked and Acklins islands, you'll pass close to one of the Caribbean Basin's rare atolls. It's Hogsty Reef Atoll, and it sits in 6,000 feet of ocean. A spit of white sand island above giant sponges and black coral trees, it clutches the wrecks of at least two ships. This is strictly live-aboard territory, though, more than 100 miles from the nearest island.

But I don't have to go that far for my own rare diving experience. I simply head out from Long Island to Barracuda Heads in 50 feet of ungodly clear water with two wry native dive-

masters, Delbert and Robert. Flipping around the edge of an immense baroque coral head I encountered Robert, who appeared to be amusing himself by sparring with a large uprooted sponge. It's a Kodak moment to be sure: Robert and sponge, slow mo, in the water column with one very attentive 15-pound Nassau grouper no more than a foot from the back of Robert's head. Up goes the sponge; *pop* goes Robert; up goes the sponge; *gulp* goes the grouper, the dreadlocks in Robert's beard swinging to-and-fro just beneath his second stage like tiny beaded tails.

I hovered motionless in the clear tropical ocean, smiling so wide my regulator shifted in my mouth, shifted like reality itself here in these Out Islands. It is a reality as ethereal as cloud vapor, dissolving and then reforming again inside its vast, dappled green banks—a reality seen once through the window of a distant plane, and then examined up close, from inside a mask.

Bill Belleville is the senior editor of Rodale's Scuba Diving.

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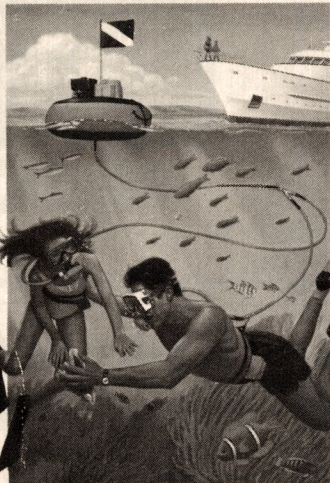
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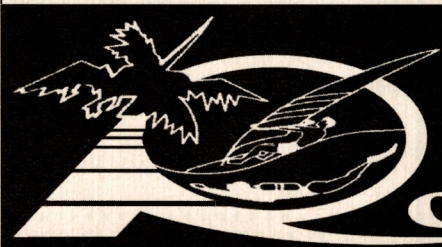
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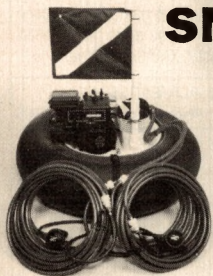
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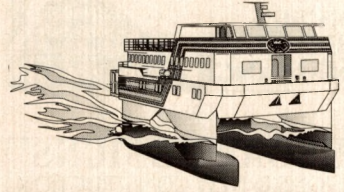


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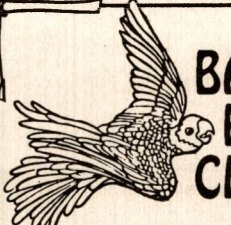
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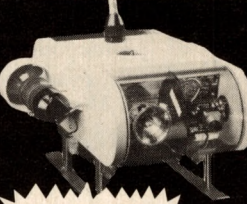
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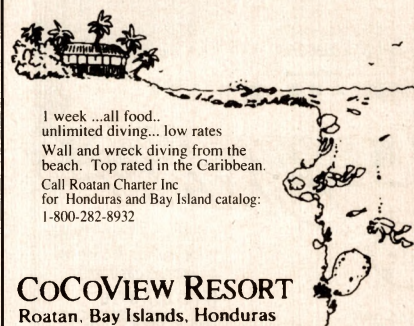
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TAMPA	Scuba Unlimited	(813) 960-7748	GREENFIELD	Linn's Sporting Goods & Scuba	(317) 894-3000	GRAND HAVEN	Under Pressure	(616) 847-6000
TAVERNIER	Florida Keys Dive Center	(305) 852-4599	INDIANAPOLIS	Midwest Scuba Center	(317) 872-2522	GRAND RAPIDS	A & D Diving Academy	(616) 363-7711
TAVERNIER	Floridaize Dive Center	(305) 852-1432	INDIANAPOLIS	Scuba Adventures Divers Supply	(317) 253-2000	GRAND RAPIDS	Skamt Scuba Shop	(616) 369-9880
TAVERNIER	Tavernier Dive Center	(305) 852-4007	KOKOMO	Diving Den	(317) 452-1034	JACKSON	Divers Mast	(517) 784-5862
TEQUESTA	Subsea Aquatics, Inc.	(407) 744-6674	LOGANSPOUT	DNP Diving	(219) 735-3483	KALAMAZOO	Dive Site	(616) 323-3700
VENICE	Gulf Coast Dive Center	(813) 484-3483	MISHAWAKA	Mermaid's Quest Scuba	(219) 256-6875	LANSING	ZZ Underwater World	(517) 485-3894
VERO BEACH	Deep Six Dive/Watersports	(800) 732-9685	MUNCIE	Leaird's Underwater SVC	(317) 288-8144	LINCOLN PARK	Michigan Underwater School	(313) 388-1322
VERO BEACH	Goldflippers	(407) 770-0204	TERRE HAUTE	Scubaland	(812) 234-0774	MT CLEMENS	Bruno's Dive Shop, Inc.	(313) 792-2040
WEST PALM BEACH	Ocean Sports	(407) 641-1144	WARSAW	Arrow Scuba Connection	(219) 267-2682	NILES	Michiana Scuba	(616) 683-4502
WEST PALM BEACH	The Scuba Club, Inc.	(407) 844-2466	WEST LAFAYETTE	Lafayette Divers Supply, Inc.	(317) 743-1232	PLYMOUTH	Divers, Inc.	(313) 971-7770
WILLISTON	Blue Grotto Dive Resort	(904) 528-5770	IOWA			ST CLAIR SHORES	Advanced Aquatics Diving, Inc.	(313) 779-8777
ZEPHYRHILLS	Aquatic Adventures Scuba	(813) 788-6476	ARNOLD'S PARK	Okoboji Scuba Center	(712) 332-5054	TRAVERSE CITY	Great Lakes Scuba	(616) 946-1602
GEORGIA			DAVENPORT	Mar's Marine & Dive Shop	(319) 324-8771	WARREN	Macomb Scuba Center	(313) 558-9922
ATENS	Anchorline Scuba Center	(706) 548-2850	DES MOINES	Iowa State Skin Diving Schools	(515) 255-0001	WATERFORD	Pro Scuba Center	(313) 674-3483
ATHENS	Charbon's Specialty Sports	(404) 548-8822	KANSAS			WYOMING	Great Lake Dive Locker	(616) 531-9440
ATLANTA	Diving World	(404) 634-4354	COLBY	Pirate's Den	(913) 462-6631	MINNESOTA		
AUGUSTA	Open Water Sports, Inc.	(706) 855-6511	GARDEN CITY	Tri States Scuba School	(316) 275-0801	BRAINERD	Minnesota School/Diving, Inc.	(218) 829-5953
BUFORD	Lanier Dive Court, Inc.	(404) 271-2860	MANHATTAN	Aggie Dive Shop	(913) 539-DIVE	BURNSVILLE	Fantasia Scuba	(612) 890-DIVE
COLUMBUS	Planet Ocean Scuba Center	(404) 563-8675	OVERLAND PARK	Sonshine Scuba	(913) 677-3286	DETROIT LAKES	Tri-State Diving	(218) 847-4868
DORAVILLE	Divers Supply Atlanta	(404) 939-3483	SHAWNEE MISSN	Scuba Adventures	(913) 962-2323	HERMANTOWN	Innerspace	(218) 729-9028
DULUTH	Dive...Dive...	(404) 476-7833	SPRINGDALE	Sportsco	(501) 751-0636	MAPLEWOOD	Northland Divers, Inc.	(612) 777-4278
FAYETTEVILLE	Peachtree Dive Center	(404) 487-6609	WICHITA	Adventure Sports, Inc.	(316) 689-8051	MINNEAPOLIS	Scuba Center	(612) 925-4818
GAINESVILLE	Ventures Sports	(404) 287-1180	WICHITA	Midwest Diving Center	(316) 265-3555	MINNEAPOLIS	Scuba Outlet Store	(612) 823-7219
MACON	Divers Supply Macon	(912) 474-6790	WICHITA	Oz Travel Ski & Scuba	(316) 684-9738	MINNEAPOLIS	Smith Diving	(612) 789-DIVE
MARIETTA	Aqua World Dive Center, Inc.	(404) 426-8591	KENTUCKY			MOORHEAD	Mick's Scuba, Inc.	(218) 233-0448
MARIETTA	Dive Shop	(404) 424-7700	CERULEAN	Dive Cerulean	(502) 887-3584	MOORHEAD	Northwest Divers	(218) 233-6088
MARIETTA	Garrard Dive Educators	(404) 984-0382	FLORENCE	Northern KY Dive Center	(606) 283-1550	MOORHEAD	Paradise Divers	(218) 233-1758
MARTINEZ	Full Sail Sports Adventure	(706) 868-5939	HAZARD	Nemo's Under See Adv	(606) 279-4572	ROCHESTER	Minnesota Dive Center	(507) 288-8802
POOLER	Divers Supply Pooler	(912) 748-8004	HYDEN	Nemo's Under See Adv	(606) 279-4572	SAUK RAPIDS	Underwater Sports Shop	(612) 251-8967
POWDER SPRINGS	Diver's Depot	(404) 439-1984	LEXINGTON	New Horizons	(606) 277-1234	MISSISSIPPI		
SAVANNAH	Diving Locker/Ski Chalet	(912) 927-6604	LOUISVILLE	Kentucky Diving Headquarters	(502) 897-6481	BILOXI	Dive Five, Inc.	(601) 385-7664
SAVANNAH	Palmetto Dive	(803) 681-3483	LOUISVILLE	Louisville Dive Center	(502) 458-8427	JACKSON	Aquaspace Scuba	(601) 957-3096
SMYRNA	Safari Scuba	(404) 432-6926	LOUISVILLE	Watersports	(502) 423-7334	MERIDIAN	Out 'N Under	(601) 693-5827
STOCKBRIDGE	Wet Set Scuba	(404) 389-9949	SOMERSET	Scuba Works	(606) 679-4748	OXFORD	Ron's Dive Shop	(210) 236-4992
THOMASVILLE	JT Watersports	(912) 228-9005	LOUISIANA			RIDGELAND	Sea Urchins III, Inc.	(601) 956-2184
VALDOSTA	Southern Ocean Sports	(912) 244-4084	ANACOCO	Dive Toledo Scuba Center	(318) 286-5565	TUPELO	Scuba South	(601) 841-2838
HAWAII			BATON ROUGE	Underwater Adventures	(504) 927-3483	MISSOURI		
CAMP SMITH	Aaron's Dive Shop	(808) 477-0514	BOSSIER CITY	Ernie's Underwater Paradise	(318) 746-0920	BONNE TERRE	Bonne Terre Mine	(314) 731-5003
HALEIWA	Surf & Sea	(808) 637-9887	DELCAMBRE	Divers Unlimited	(318) 685-2703	BRIDGETON	West End Diving	(314) 731-5003
HONOLULU	Paradise Snorkel Adventures	(808) 923-7766	GRETN	La Divers	(504) 391-2049	COLUMBIA	Captain Nemo's Dive Shop	(314) 442-3483
HONOLULU	South Pacific Scuba, Inc.	(808) 735-7196	JEFFERSON	Vineyard's Dive Shop-PADI	(504) 833-5657	COLUMBIA	Columbia Discount Scuba	(314) 442-3896
HONOLULU	Underwater Sports of Hawaii	(808) 926-3483	KENNER	Square World Dive Center	(504) 443-3483	INDEPENDENCE	Skin 'N Scuba Dive Shop	(816) 358-0855
HONOLULU	Underwater Sports of Oahu	(808) 926-3483	MARRERO	Aqua Tech Dive Center	(504) 341-3483	JEFFERSON CITY	Scuba Adventure	(314) 634-3483
KAHULUI	Maui Dive Shop	(808) 871-2111	METAIRIE	Caribbean Dive Shop	(504) 831-7071	JOPLIN	Dive Masters	(417) 624-4400
KAILUA	Aaron Dive	(808) 262-2333	NEW ORLEANS	Sea Horse Diving Academy	(504) 246-6523	JOPLIN	Sports & Scuba Center	(417) 623-6005
KAILUA-KONA	Big Island Divers	(800) 329-6068	NEW ORLEANS	The Scuba Company	(504) 244-6292	KANSAS CITY	Dive Shop, Inc.	(816) 455-1492
KAILUA-KONA	Jack's Diving Locker	(800) 345-4807	SLIDELL	The Scuba Company Too	(504) 646-1919	KANSAS CITY	Divers Equip Scuba Center	(816) 763-5678
KIHEI	Maui Dive Shop	(808) 879-3388	SLIDELL	Water Sports Center, Inc.	(504) 641-3700	KIMBERLING CITY	Port Of Kimberling Scuba	(417) 739-5400
KIHEI-WAILEA	Ed Robinson's Diving Adventures	(800) 635-1273	WESTWEGO	Temento's Diving Center	(504) 347-5402	LAKE OZARK	Divers Village	(314) 365-1222
LAHAINA	Captain Nemo's Ocean Emporium	(800) 367-8088	MAINE			LICKING	Boiling Springs Dive Center	(314) 674-2043
LAHAINA	Dive Maui	(808) 667-2080	BANGOR	Maine Divers	(207) 990-3483	ORONOGO	Captain John's Sports & Scuba	(417) 673-2724
LAHAINA	Lahaina Divers, Inc.	(808) 661-4505	CALAIS	Kissing Fish Dive Shack	(207) 454-7440	SPRINGFIELD	Aquasports Scuba Center	(417) 883-5151
LAHAINA	Pacific Dive Services	(808) 667-5331	PORTLAND	Tommy's Dive Shop	(207) 772-5357	ST CHARLES	The Great American Diving Co.	(314) 949-0880
PEARL CITY	Aaron's Dive Shop	(808) 487-5533	YORK BEACH	York Beach Scuba	(207) 363-4982	ST LOUIS	Dive Shop Of St. Louis	(314) 968-8099
WAIHAWA	Rainbow Divers	(800) 982-6747	MARYLAND			ST LOUIS	West End Diving	(314) 822-3005
WAIPO	Ocean Concepts Scuba Dist.	(808) 677-7975	ANNAPOLIS	Annapolis Scuba Center	(301) 266-8327	ST LOUIS	Y-Kiki Divers	(314) 469-8722
IDAHO			BALTIMORE	Divers Den, Inc.	(410) 668-6866	MONTANA		
BOISE	Boise Water Sports	(208) 342-1378	BELTSVILLE	River & Sea Water Sports	(301) 595-2867	BOZEMAN	Sports Cove	(406) 585-9926

HELENA	Montana Outdoor Sports	(406) 443-4119	CLAREMONT	The Dive Shop	(704) 459-7440	FLORENCE	Southern Scuba & Water Sports	(803) 662-7666
NEBRASKA			CONOVER	The Dive Experience	(704) 464-3483	GOOSE CREEK	Low Country Divers/Charleston	(803) 764-3164
KEARNEY	Heartland Scuba Center	(308) 237-7943	DUNN	Breeze SCUBA	(919) 892-7327	GREENVILLE	Adventures In Scuba, Inc.	(803) 268-0631
OMAHA	DiveStar	(402) 391-1155	DURHAM	Water World Marine Services	(919) 596-8185	GREENVILLE	Divers World Scuba Diving Sch	(803) 277-8659
OMAHA	Mid Coast Divers Supply	(402) 391-1559	GREENSBORO	Blue Dolphin Dive Center II	(919) 632-9838	MT PLEASANT	Aqua Ventures	(803) 884-1500
OMAHA	Underwater World	(402) 339-1884	GREENSBORO	Island Hoppers, Ltd.	(919) 854-3483	NORTH AUGUSTA	Neptune Dive & Ski	(803) 279-2797
NEVADA			GREENVILLE	Ocean Wonders Dive Center	(919) 758-1444	ROCK HILL	Scuba Ventures	(803) 328-0000
CARSON CITY	High Sierra Sports	(702) 885-1891	JACKSONVILLE	Bottom Time Dive Center	(800) 527-2822	TAYLORS	The Scuba Connection	(803) 244-5282
CARSON CITY	Strictly Scuba	(702) 884-3483	JACKSONVILLE	Crystal Coast Diving	(800) 843-4834	TENNESSEE		
HENDERSON	American Cactus Divers	(702) 564-6810	LAURINBURG	NC Scuba	(919) 276-9302	BRENTWOOD	American Scuba Center	(615) 371-0000
LAKE TAHOE	Diving Edge	(702) 588-5262	LONG BEACH	Carolina Cape Divers	(919) 278-5611	BRISTOL	Adventure Diving	(615) 764-5777
LAS VEGAS	Caribe Diving Related Ventures	(702) 873-6611	MOORESVILLE	The Sea Diver	(704) 663-4837	JOHNSON CITY	Scuba Center	(615) 928-3483
RENO	Sierra Diving Center	(702) 825-2147	MOREHEAD CITY	Olympus Dive Center	(919) 726-9432	KNOXVILLE	Adventure Swim, Scuba & Travel	(800) 691-2525
RENO	Tropical Penguins Scuba	(702) 828-3483	NEW BERN	Tarheel Divers, Inc.	(919) 633-4544	KNOXVILLE	Ski-Scuba Center, Inc.	(615) 673-8733
NEW HAMPSHIRE			NEWPORT	Tropical Scuba Supply	(919) 393-8293	MEMPHIS	H2O Scuba Center	(901) 458-5006
KEENE	Underwater Sports of NH	(800) 457-4430	WILMINGTON	Aquatic Safaris Scuba	(919) 392-4386	MURFREESBORO	Adventure Technologies	(615) 890-3948
LEBANON	New England Dive Center	(603) 448-1222	WINSTON-SALEM	New Wave Dive & Travel	(919) 659-9500	NASHVILLE	Blue Water Scuba	(615) 356-9340
MANCHESTER	Diver's Den Dive Shop	(603) 627-2536	YAPON BEACH	Carolina Cape Divers, Inc.	(919) 278-5611	NASHVILLE	Diving Adventures, Inc.	(615) 333-3483
NEWBURY	La Porte's Skindiving	(603) 763-5353	OHIO			TEXAS		
NORTH HAMPTON	North Atlantic Scuba Sales	(603) 964-6335	CINCINNATI	Divers Den	(513) 232-3333	ABILENE	School Of Scuba	(915) 673-2949
NEW JERSEY			CINCINNATI	Eastgate Scuba	(513) 752-7681	ABILENE	The Dive Spot	(915) 673-3483
CHERRYHILL	New Jersey Scuba Supply	(609) 751-6702	COLUMBUS	Ask Water Sports, Inc.	(614) 889-2822	AMARILLO	Scuba Sportz	(806) 355-3443
COLLINGSWOOD	Mar-Vel Underwater Equip, Inc.	(609) 962-8719	COLUMBUS	Underwater Connection	(614) 487-9777	ARLINGTON	A.K.A. Divers	(817) 275-2181
EDISON	Bull Dog Diving	(908) 321-3757	CONNEAUT	Ted's Scuba	(216) 224-1112	ARLINGTON	Arlington Scuba Center	(817) 265-6712
FREEHOLD	The Scuba Center	(908) 462-4660	DAYTON	Miami Valley School of Diving	(513) 434-3483	AUSTIN	Double D Diving, Inc.	(512) 331-2199
HAMILTON	Scuba Exp. & Aquatics	(609) 584-8008	ELYRIA	Underwater Dive Center	(216) 324-3434	AUSTIN	Great Outdoors	(512) 453-1852
HURFVILLE	The Dive Shop of NJ	(609) 589-3597	FAIRFIELD	Sand Dollar Divers, Inc.	(513) 858-2700	AUSTIN	Scubaland Adventures	(512) 339-0733
MAPLE SHADE	Aqua-Tech Scuba Center	(609) 482-1996	LAKEWOOD	Aqua Specialists	(216) 521-4855	AUSTIN	Tom's Dive & Ski, Inc.	(512) 451-3425
MAPLE SHADE	The Dive Shop of NJ	(609) 778-4477	NILES	Treasure Cove Scuba	(216) 544-6230	BELTON	Totally Scuba	(817) 939-1458
MILLTOWN	Fantasea Scuba & Aquatic Ctr.	(908) 846-5200	PIQUA	Underwater Warehouse	(513) 773-2027	BROWNSVILLE	Batsell's Sporting Goods	(512) 542-2526
NEPTUNE CITY	Professional Divers, Inc.	(908) 775-8292	PORT CLINTON	New Wave	(419) 734-2240	CARROLLTON	Adventure Beneath Sea	(214) 484-3483
NORTHFIELD	East Coast Diving	(609) 646-5090	REYNOLDSBURG	Sub-Aquatics	(614) 864-1235	CARROLLTON	For Divers Only	(214) 317-2822
PRINCETON	Princeton Aqua Sports	(609) 924-4240	ROOTSTOWN	Jrs School of Scuba	(216) 325-2233	COLLEGE STA	Sea-U Underwater	(409) 693-0104
PT PLEASANT	Inlet Dive Center	(908) 899-4545	SANDUSKY	Dale's Diving Shop	(419) 625-4134	CONROE	Conroe Scuba	(409) 539-1414
RAMSEY	Blue Water Divers	(201) 327-2822	TIFFIN	Steve's Scuba	(419) 447-3483	CORPUS CHRISTI	Aquanox Scuba	(512) 949-9491
ROBBINSVILLE	Underwater Connection NJ	(201) 295-2579	TOLEDO	Diver's Paradise	(419) 535-6828	CORPUS CHRISTI	Ascula Venture	(512) 949-9762
ROCHELLE PARK	Underwater Sports, Inc.	(201) 843-3340	VIENNA	Dive In Scuba Shp	(216) 856-6275	DE SOTO	Divers Isle	(214) 230-1481
ROCKAWAY	Elite Divers, Inc.	(201) 586-2214	WESTERVILLE	Aquanuts	(614) 891-1234	DENTON	Island Divers, Inc.	(817) 383-3483
SEWELL	The Dive Shop Of NJ	(609) 589-9336	WILLOUGHBY	Anchor Dive Center/Wiloughby	(216) 942-7575	EL PASO	Desert Scuba	(915) 593-3483
STIRLING	Valley Sports	(908) 580-1188	OKLAHOMA			EL PASO	Inner Space S.C.U.B.A.	(915) 532-4107
TRENTON	Lang's Ski & Scuba	(908) 538-1970	MOORE	Clearwater Divers, Inc.	(405) 799-3483	FORT WORTH	Lone Star Scuba	(817) 377-3483
WHITEHOUSE STATION	Whitehouse Aquatic Center	(908) 534-4090	MUSKOGEE	Reese's Underwater Sports	(918) 687-6344	GALVESTON	Diver's Education Equipment	(409) 765-9746
NEW MEXICO			NORMAN	Oklahoma Scuba Shop	(405) 686-8111	GRAND PRAIRIE	Tucker's Dive Shop, Inc.	(214) 264-7305
ALBUQUERQUE	New Mexico Scuba Center	(505) 271-0633	OKLAHOMA CITY	Hi-Performance Scuba	(405) 755-2353	GROVES	Openwater Scuba School	(409) 727-4545
ALBUQUERQUE	The Scuba Company	(505) 888-7990	TULSA	Dive Site	(918) 664-5717	HITCHCOCK	Treasure Cove Scuba	(409) 938-4413
LAS CRUCES	Potter Scuba Center	(505) 523-2911	TULSA	Poseidon Adventures, Ltd.	(918) 749-DIVE	HOUSTON	Divers Choice	(800) 256-6153
NEW YORK			TULSA	Seahorse Scuba, Inc.	(918) 627-3607	HOUSTON	International Scuba	(713) 768-5449
ANGOLA	Point Breeze Dive Shop	(716) 549-3768	WEATHERFORD	Humo's Mens & Ladies Dive Shop	(405) 772-2662	HOUSTON	Kenlee's West	(713) 784-1173
BROOKLYN	Atlantic Divers	(718) 376-5454	OREGON			HOUSTON	Texas Scuba	(713) 880-1287
BROOKLYN	Scuba Divine	(718) 647-1089	ALOHA	Pacific Watersports, Inc.	(503) 642-3483	HOUSTON	Longview Pro Scuba	(903) 757-3107
BROOKLYN	Stingray Divers	(718) 384-1280	BROOKINGS	Reed's Divers Den	(503) 469-0497	MIDLAND	Stovall's Scuba Center	(915) 699-5959
BUFFALO	Action Diver	(716) 836-6900	CENTRAL POINT	Aqua Fantasea	(503) 776-3483	ODESSA	Adventure Scuba	(915) 580-4545
CLIFTON PARK	Divers World	(518) 373-0521	EUGENE	Eugene Skin Divers Supply	(503) 342-2351	ODESSA	Scuba Shack	(915) 362-2763
CORTLAND	Aqua Ventures	(607) 753-9990	EUGENE	Specialty Sports	(503) 686-0798	ORANGE	Orange Dive & Ski Supply	(409) 883-4846
EAST ROCHESTER	Scuba Hut, Ltd.	(716) 385-6430	GRANTS PASS	DC Scuba & Snorkel	(503) 478-8509	PLANO	Aqua Sports	(214) 424-6563
ELMHURST	Diver's Rendez-Vous	(718) 478-4097	GRESHAM	White Orca Divers	(503) 761-9643	PLANO	Ocean's Window Scuba Training	(214) 423-3863
ELMIRA	Southside Variety/Dive Center	(800) 564-7619	KLAMATH FALLS	Adventure Diving	(800) 423-7989	RICHARDSON	Divers World, Inc.	(214) 231-7845
ENDICOTT	Seafin Scuba Center	(607) 754-0873	PHOENIX	Reese's Dive Shop	(503) 535-2223	ROUND ROCK	Echo Valley Scuba Center	(512) 388-0880
FREEPORT	Island Scuba Center, Inc.	(516) 546-2030	PORTLAND	Aquatic Sports & Scuba	(503) 245-4991	SAN ANGELO	Mike's Dive World	(915) 947-1662
FULTON	Ontario Scuba, Inc.	(315) 593-8040	PORTLAND	Horizon Water Sports	(503) 297-8133	SAN ANTONIO	Bar's Scubafun Center	(512) 829-1699
JAMESTOWN	Underwater World	(716) 569-5509	PORTLAND	Streed's Scuba Unlimited	(503) 777-3347	SAN ANTONIO	Dive Masters	(512) 344-3483
KINGS PARK	Oceanrock	(516) 265-3507	PENNSYLVANIA			SAN ANTONIO	Trident Diving Equipment	(512) 734-7442
LATHAM	Capitaland Scuba Center	(518) 783-3483	ALLENTOWN	Sea-World Divers	(215) 432-6866	SAN ANTONIO	Tropical Divers/RGC, Inc.	(512) 490-DIVE
LEWISTOWN	Tiedemann's Scuba Center	(516) 796-6560	ARDMORE	Aqua-Tech Dive Center	(215) 642-DIVE	SAN MARCOS	The Dive Shop	(512) 396-3483
LITTLE NECK	Dolphin Divers	(718) 229-2300	BAINBRIDGE	Bainbridge Sportmen's Club, Inc.	(717) 426-2114	SHERMAN	Scuba Etc. Of Sherman	(903) 868-0604
MAHOPAC	Putnam Dive Center	(914) 628-1386	BENSALEM	Mid-Atlantic Scuba Center	(215) 245-0141	SOUTH PADRE	The Dive Shop	(512) 761-9632
MAMARONECK	Dive Locker	(914) 381-5935	BETHLEHEM	The Scuba Tank	(610) 868-7373	SOUTH PADRE ISLAND	American Diving	(210) 943-7124
MEDFORD	The Scuba Shoppe	(516) 289-5555	BRYN MAWR	Underwater World, Inc.	(215) 527-9681	SPRING	Adventure Quest	(713) 320-0001
MIDDLETOWN	Middletown Scuba	(914) 343-2858	CHAMBERSBURG	Adventure Sports	(717) 267-3604	UNIVERSAL CITY	Duggan Diving Enterprises	(512) 658-7495
NEW HARTFORD	All American Sports Shop	(607) 334-5277	COGAN STATION	The Aquanaut Dive Shop	(717) 998-2486	WEBSTER	Discover Scuba	(713) 480-8530
NEW YORK	Pan Aqua Diving	(212) 496-2267	CONSHOHOCKEN	Diver Services, Inc.	(215) 828-4236	WICHITA FALLS	Double D Divers	(817) 322-5934
PENDLETON	Aquatic Fantaseas, Inc.	(716) 625-8035	ERIE	Diver's World	(814) 459-3195	WICHITA FALLS	Ultimate Sports	(817) 692-2000
PORT CHESTER	Byram Bay Sports, Inc.	(914) 937-2685	ERIE	Fantaseas Water Gear	(814) 835-3483	UTAH		
POUGHKEEPSIE	Dutchess Diving Center, Inc.	(914) 462-0255	GREENSBURG	Underwater Adventures	(412) 837-1070	BOUTIFUL	Dive Shop	(801) 292-8164
POUGHKEEPSIE	Marsh Scuba Supply, Inc.	(914) 452-8994	HONESDALE	Pisces Divers	(717) 253-0552	MURRAY	Scuba Vacation Center	(801) 262-3413
REGO PARK	Sea Horse Divers, Inc.	(718) 897-2885	HORSHAM	Underwater World, Inc.	(215) 672-4180	NEAR GRANTSVILLE	Bonneville Sea Base	(801) 884-3874
RIVERHEAD	Peconic Scuba	(516) 727-7578	IRWIN	Randy's Dive Shop, Inc.	(412) 863-0752	OGDEN	Dive Utah	(801) 394-8842
ROCHESTER	Fantasea Adventures	(716) 266-2754	JERSEY SHORE	Sunken Treasure Dive Shop	(717) 398-1458	OREM	Water World Divers	(801) 224-8181
ROCKY POINT	Swim King Dive Shop, Inc.	(516) 744-7707	MCKEES ROCK	Aquatic Adventures, Inc.	(412) 788-4511	SALT LAKE CITY	Neptune Adventures	(801) 466-9630
SOUTH GLEN FALLS	Adirondack Aquatics	(518) 792-5752	MEDIA	Anchor Line Dive Shop	(215) 566-2330	SALT LAKE CITY	Scuba Utah	(801) 942-2100
SOUTHAMPTON	Sunrise-Sunset Surf/Dive/Sport	(516) 283-2929	MORRISVILLE	Underwater Connection N.J.	(215) 295-2579	VERNAL	Atlantis Divers	(801) 789-3616
STATEN ISLAND	Aqua-Dive, Inc.	(718) 442-0023	PHILADELPHIA	Blue Horizons Dive Center	(215) 462-7587	VERMONT		
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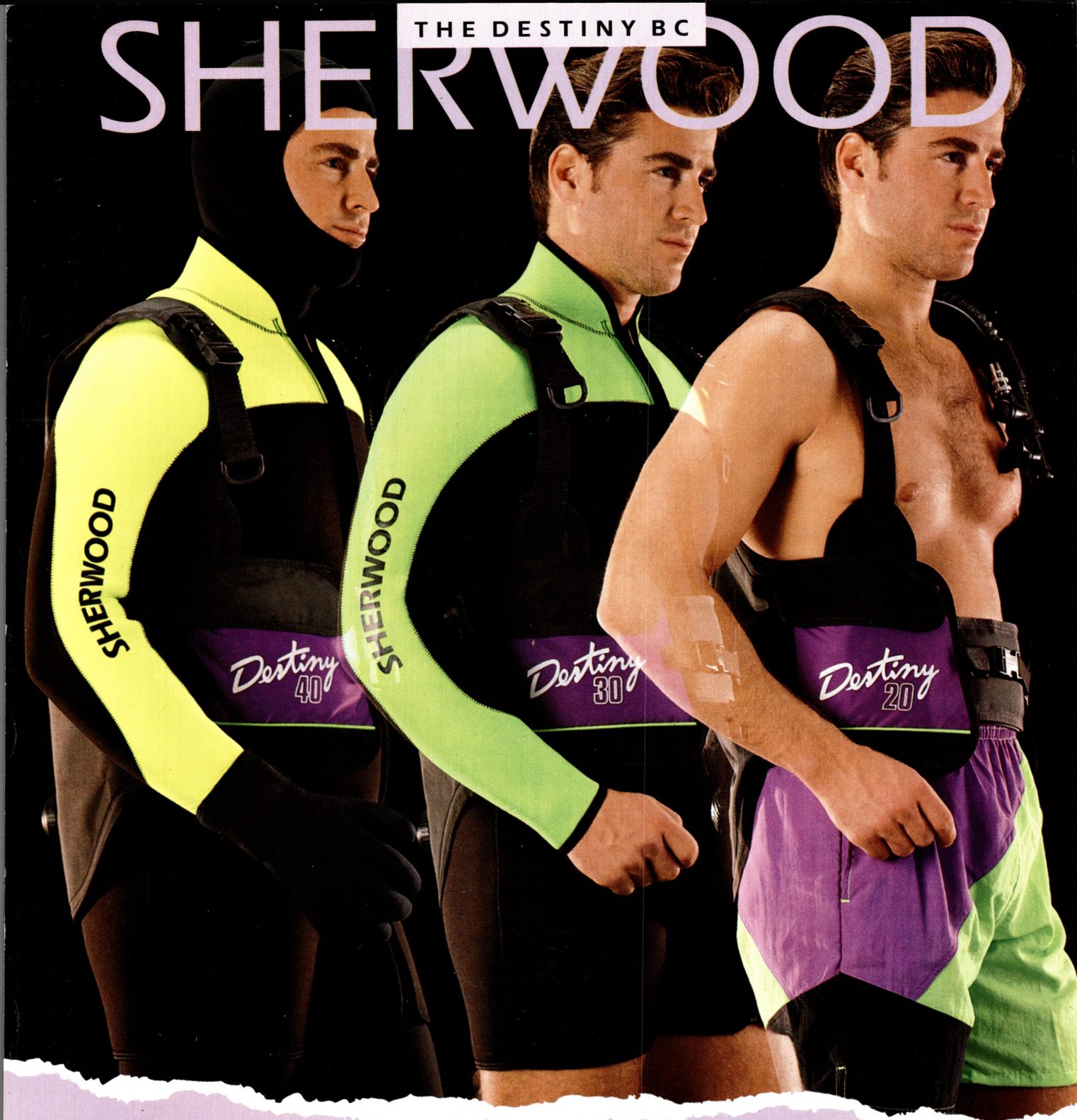
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